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# COOPERATIVE MINE DRAINAGE SURVEY, KISKIMINETAS RIVER BASIN

Environmental Protection Agency
Wheeling, West Virginia

April 1972

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# COOPERATIVE MINE DRAINAGE SURVEY

## Kiskiminetas River Basin

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# COOPERATIVE MINE DRAINAGE SURVEY
# KISKIMINETAS RIVER BASIN

APRIL 1972

Prepared By:

U. S. Environmental Protection Agency
Wheeling Field Office
Wheeling, West Virginia

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# SUMMARY

Each of the sub-basin watersheds of the Kiskiminetas River basin experience the widespread problem of coal mine drainage pollution. Various measures are needed to reverse the water quality degradation that has occurred in the seven watershed areas. A brief summary of each watershed follows:

## Kiskiminetas River, main stem and minor tributaries

A total of 89 discharging sources and approximately 1,475 acres of surface mined land were investigated in this area. The total effluent from the discharging sources was nearly 6.4 million gallons per day (mgd). The total acid load discharged to the Kiskiminetas River and its minor tributaries below the community of Saltsburg was 57,880 lb/day. Seventeen principal mine drainage sources were located in the study area. These sources discharged a total net acid load of 46,613 lb/day, about 81 percent of the acid load discharged by all sources in the watershed.

## Loyalhanna Creek

The water quality degradation resulting from coal mine drainage in the Loyalhanna Creek watershed is most apparent below the community of Latrobe. A total of 52 discharging sources and approximately 900 acres of surface mined land were investigated during the study period. The total net acid load contributed by the 52 sources was 65,407 lb/day. Approximately 96 percent of this acid load (65,407 lb/day) was contributed by 15 principal

/

sources (Mine No.'s 5177, 5356, and 5364) contributed a combined acid load of nearly 25 tons per day.

## Conemaugh River

A total of 36 discharging sources and approximately 1,700 acres of surface mined land were investigated during the study. The total net acid load discharged to receiving streams was 35,104 lb/day. Abandoned drift mines and coal refuse piles were the major sources of mine drainage discharge. A total of six principal source sites were located in the watershed. These sources contributed a total net acid load of 30,495 lb/day, or about 86 percent of the total watershed acid load.

## Blacklick Creek

Several hundred mining sites and approximately 1,675 acres of surface mined land were investigated in the Blacklick Creek watershed. A total of 161 sites discharging at the time of survey contributed an acid load of 273,073 lb/day. During the study, fourteen discharges emanating from active mines were inventoried in the watershed. The acid load from these sources represented about one-half of the total watershed load. However, the pollutional loading from active mines has since been significantly reduced by the installation of treatment facilities. Eighteen principal sources of abandoned mine drainage were located during the study. These sources discharged a combined acid load of more than 125,000 lb/day to receiving streams in the Blacklick Creek watershed.

## Two Lick Creek

Abandoned drift mines, shaft mines, and mine refuse piles were the major sources of mine drainage pollution in the Two Lick Creek watershed. During the study, a total of 174 discharging mine sites contributed an acid load of 36,645 lb/day to receiving streams in the study area. Twelve principal sources of mine drainage were identified during the survey. These twelve sites contributed an acid load of 29,114 lb/day, about 80 percent of the total acid load discharged by all 174 sources.

## Little Conemaugh River

A total of 99 discharging sources and approximately 1,400 acres of surface mined land were investigated in the study area. Discharges from these sources totalled more than 29 million gallons per day (mgd). Abandoned drift mines and shaft mines were the major source of mine drainage discharge in the Little Conemaugh River basin. Seven principal drainage sources contributed about 80 percent of the total basin-wide acid load (153,570 lb/day).

## Stony Creek

Approximately 5,700 acres of surface mined land and 199 discharging sources were investigated in the Stony Creek watershed. Discharges from the coal mine sources totalled 23.7 million gallons per day. The total net acid load was 97,310 lb/day. Abandoned drift mines were the major contributor of mine drainage pollution. Shaft mines and mine refuse piles were also significant contributors of acid discharge. Thirteen principal mine drainage sources were identified in the Stony Creek watershed. These sources discharged a total net acid load of 61,761 lb/day, about 63 percent of the total acid load discharged by all 199 sources in the watershed.

A summary by watershed study area for the Kiskiminetas River basin is presented in Table 1. A summary by source type for all mine discharges in the basin is presented in Table 2. Load values shown in these tables reflect the conditions measured during the 1968 study and are exclusive of any mine drainage treatment facilities installed since the date of inventory.

## Table 1

### Mine drainage loadings by receiving stream

### Kiskiminetas River basin

| Area | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Kiskiminetas River, main stem & minor tributaries | 89 | 4,439 | 57,880 | 25,525 | 82,000 | 8,802 | 396 | 2,979 |
| Loyalhanna Creek | 52 | 11,165 | 65,407 | 102,853 | 170,993 | 26,090 | 1,476 | 1,514 |
| Conemaugh River | 36 | 3,045 | 35,104 | 20,979 | 47,662 | 11,587 | 360 | 909 |
| Blacklick Creek | 161 | 25,196 | 273,073 | 112,616 | 472,768 | 58,174 | 1,525 | 13,798 |
| Two Lick Creek | 174 | 7,102 | 36,645 | 29,582 | 70,589 | 4,023 | 304 | 2,415 |
| Little Conemaugh River | 99 | 20,433 | 153,570 | 183,730 | 337,341 | 55,306 | 1,663 | 4,733 |
| Stony Creek | 199 | 16,461 | 97,310 | 81,211 | 188,971 | 18,761 | 962 | 2,836 |
| TOTALS | 810 | 87,841 | 718,989 | 556,496 | 1,370,324 | 182,743 | 6,686 | 29,184 |

Table 2

Mine drainage loadings by source type

Kiskiminetas River basin

| Source Type | No. of Sources | Total Discharges (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Drift Mines (abandoned) | 369 | 28,277 | 235,443 | 149,207 | 397,086 | 46,641 | 1,706 | 8,144 |
| Drift Mines (active) | 22 | 3,521 | 13,820 | 19,657 | 41,707 | 1,249 | 140 | 410 |
| Strip Mines (abandoned) | 159 | 3,401 | 17,470 | 11,963 | 27,719 | 2,263 | 369 | 872 |
| Strip Mines (active) | 8 | 304 | 909 | 1,512 | 2,472 | 30 | 33 | 9 |
| Combination Mines (abandoned) | 120 | 3,736 | 29,972 | 14,646 | 42,548 | 5,196 | 234 | 1,425 |
| Shaft Mines (abandoned) | 33 | 29,683 | 190,737 | 260,170 | 457,057 | 76,198 | 2,842 | 4,883 |
| Shaft Mines (active) | 9 | 16,696 | 130,747 | 80,761 | 305,980 | 38,117 | 973 | 6,808 |
| Refuse Piles (abandoned) | 80 | 2,008 | 99,774 | 18,118 | 94,364 | 12,985 | 385 | 6,603 |
| Preparation Plant (active) | 1 | 25 | 84 | 219 | 255 | 45 | 1 | 0 |
| Coal Outcrops | 4 | 106 | 78 | 80 | 596 | 7 | 2 | 27 |
| Oil Wells | 2 | 52 | -82 | 97 | 427 | 4 | 0 | 3 |
| Gas Wells | 2 | 22 | 11 | 50 | 52 | 7 | 0 | 0 |
| Tunnel | 1 | 10 | 26 | 16 | 61 | 1 | 1 | 0 |
| TOTALS | 810 | 87,841 | 718,989 | 556,496 | 1,370,324 | 182,743 | 6,686 | 29,184 |

## RECOMMENDATIONS

The inventoried watersheds of the Kiskiminetas River basin are all intrastate water bodies; consequently, the primary responsibility for water pollution control in these areas rests with Pennsylvania. It is, therefore, recommended that the Commonwealth proceed to develop a detailed plan to eliminate or significantly reduce mine drainage pollution in the Kiskiminetas River basin.

It is realized that there are a number of difficult, lengthy, and expensive tasks involved in any program leading to abatement of pollutant discharges from inactive underground mining sites. A very major problem in this realm is the less than complete technical knowledge available of physical abatement measures. The following recommendations are made for the establishment of an abandoned mine drainage abatement program in the seven inventoried watersheds of the Kiskiminetas River basin. The recommendations are based on the water quality measurements performed by the Environmental Protection Agency during 1966 and the cooperative mine drainage source investigation conducted in 1968 by the EPA and the Pennsylvania Department of Environmental Resources (DER).

1. Establishment of a mine drainage source abatement priority listing. Such priorities could be assigned utilizing the data outlined in this document. The priorities can be based upon the impact and relative contribution of each source to the total watershed problem. For example, a mine discharging high acidity and/or mineral loadings would be of a higher priority than a discharge of lesser

loading located downstream of the discharge of greater pollutant loading. The priority of some sources may change as a result of item 3 below. A preliminary priority listing of principal mine drainage sources is contained under the Pollution Abatement Section of each individual watershed report.

2. Feasibility studies. Probably undertaken on a contractual basis, these preliminary studies would have the objectives of proposing abatement methods for the individual prioritized sources and estimating the cost of the methods.

3. Characterization of water quality with time. Coincident with the preliminary feasibility studies, a basin wide water quality sampling network should be established for repetitive water quality measurements. The network should include all important tributary streams receiving mine drainage and a number of locations on the principal streams. The larger mine drainage sources should also be included. Flow measurement and chemical analyses could then be performed at these locations at regular intervals, preferably weekly or bi-weekly, for a minimum of a 12-month water year.
   This phase of the total study will provide data for a pollution source priority listing based on the annual pollution contribution of each source. Also, sufficient stream water quality data will be developed to permit reasonably accurate stream quality improvement predictions from contemplated corrective programs.

4. Detailed engineering plans. Based on items 2 and 3, detailed engineering plans and final cost estimates could then be developed for the most applicable proposal from item 2; that is, most applicable from the standpoint of the greater water quality improvement to be obtained for a dollar spent.

5. Construction. Installation of appropriate physical measures could then be carried out. Monitoring of discharge changes with time at the altered sites and in the receiving streams must be an integral part of the abatement program. Routine maintenance at the controlled sources is also essential. Easements to or out-right purchase of land may be necessary for the Commonwealth of Pennsylvania to obtain control over pollutant sources on private property. Institutional changes also may need to be sought to enable the state government to achieve site control by the expenditure of public monies on private property. The acquisition of mineral rights in the area of source abatement projects may be necessary to prevent future mining activity from destroying the physical controls.

It is further recommended that, in all phases of the described abatement program, the Commonwealth of Pennsylvania seek technical and financial assistance from all appropriate agencies of the Federal government.

All conclusions, recommendations, and estimates contained in this document are subject to refinement as the programs of the EPA and the Commonwealth of Pennsylvania progress.

## BACKGROUND

Streams draining the coal fields of the Kiskiminetas River have probably been acidic in nature from the time of the opening of the first mines and they remain so at the present time. A report from the 1930's refers to the acid stream conditions in both the Kiskiminetas River as well as in major tributaries to the River (1). The initial documentation of the mine drainage problem in this basin is not known; however, it has existed for perhaps nearly a century.

In the past 40 years, a number of published and unpublished reports have described the acid stream conditions in the Kiskiminetas River. However, none of these reports were detailed or comprehensive studies of the problem.

During 1966, the Wheeling Field Office of the Environmental Protection Agency in Wheeling, West Virginia conducted a stream water quality survey of the upper Ohio River as part of the overall Appalachian Water Resources Survey (2). In the Kiskiminetas River basin, a network of 26 stream sampling stations was established for repetitive sampling and flow measurement during the 1966 field season. The survey produced quantitative data on mine drainage problem areas in the basin. The survey findings are discussed in the following section and presented in Appendix A. The locations of the 1966 water quality sampling points are shown on Figure 1.

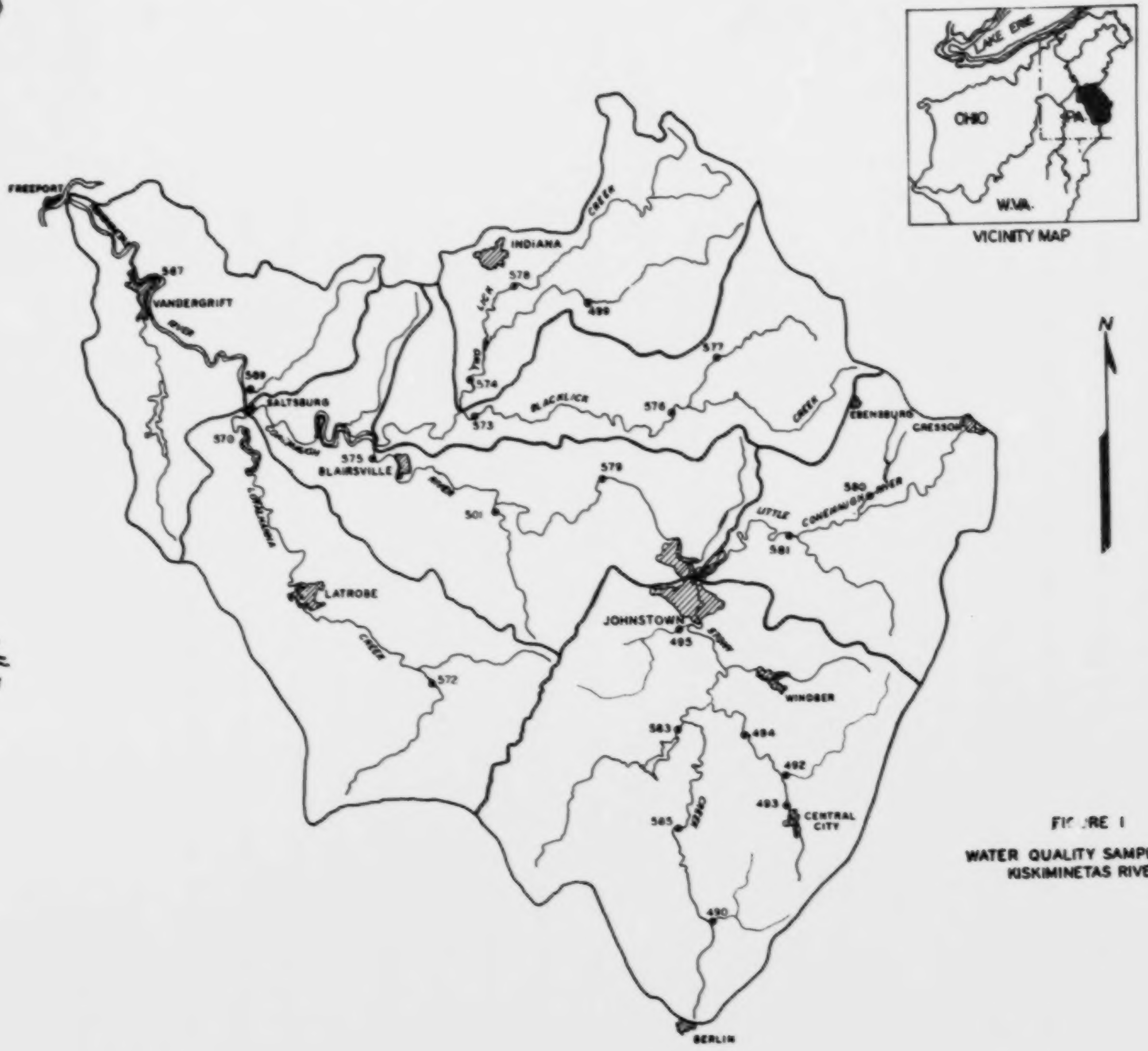
VICINITY MAP
LAKE ERIE
OHIO
PA.
W.VA.
N
FREEPORT
587
VANDERGRIFT
RIVER
589
SALTSBURG
570
CONEMAUGH
575
BLAIRSVILLE
RIVER
501
LOYALHANNA
LATROBE
CREEK
572
INDIANA
CREEK
578
499
LICK
TWO
574
573
BLACKLICK
576
577
CREEK
579
EBENSBURG
CRESSON
580
LITTLE
CONEMAUGH RIVER
581
JOHNSTOWN
495
STONY
WINDBER
583
494
492
493
CENTRAL CITY
585
CREEK
490
BERLIN

FIGURE 1

WATER QUALITY SAMPLING STATIONS
KISKIMINETAS RIVER BASIN

## STREAM WATER QUALITY - SURVEY FINDINGS, 1966

The Kiskiminetas River enters the Allegheny River 30 miles above Pittsburgh. During the survey, the Kiskiminetas River discharged a massive average net acid load of 494 tons per day as measured at Vandergrift (Sta. 567). The pH of the river ranged from 3.0 to 3.6 and the alkalinity was depleted throughout the survey. Long term water quality records show that the river discharges an average of 329 tons per day of acidity to the Allegheny River (3).

Within the Kiskiminetas watershed, there are about 485 miles of streams polluted by mine drainage. Many streams are acid even in the upper headwater areas of Somerset and Cambria Counties. The Little Conemaugh River above Johnstown (Sta. 581) carried a net acid load of 25 tons per day.

Stony Creek, which enters the Conemaugh River at Johnstown, drains 466 square miles and contains more than 100 miles of acid streams. The principal tributaries of Stony Creek are polluted by mine drainage. Shade Creek carried a net acid load of 13 tons per day (Sta 494). Additional acid loads discharged to the Conemaugh River between Johnstown and Seward, Pennsylvania raised the average net acid load in the river to 86 tons per day (Sta. 579).

Blacklick Creek and many of its tributaries are acid over their entire length. The Blacklick watershed contains over 100 miles of mine drainage polluted streams. The pH at the mouth of Blacklick Creek ranged from 2.5 to 2.9 and the total acidity concentration from 452 to 897 mg/l (Sta. 573). The net acid load of 208 tons/day discharged from Blacklick Creek is 42 percent of the net acid load discharged by the Kiskiminetas River.

A net acid load of 88 tons per day was measured on the North Branch Blacklick Creek at White Mill Crossing in Cambria County (Sta. 577). Although the watershed above this point represents only 14 percent of the Blacklick Creek watershed, 41 percent of the total net acid load of Blacklick Creek was measured here. The load at this station amounts to 18 percent of that measured in the Kiskiminetas at Vandergrift. Two Lick Creek discharged a net acid load of 38 tons per day to Blacklick Creek (Sta. 574).

The Conemaugh River below Blairsville (Sta. 575) carried a net acid load of 397 tons per day, contained no alkalinity, and exhibited a pH range of 2.9 to 3.3. Continuing downstream, the Kiskiminetas River is formed where the Conemaugh River and Loyalhanna Creek converge just above the Armstrong-Indiana County Line. Loyalhanna Creek is an acid stream over much of its length and contributed a net acid load of 57 tons per day. The pH ranged from 3.3 to 4.7 and the alkalinity was completely depleted (Sta. 570).

From the origin of the Kiskiminetas River at Saltsburg to its mouth, there are several small acid contributing tributaries. The largest of these is Blacklegs Creek which contained a net acid load at its mouth of five tons per day (Sta. 569).

During the 1966 water quality survey, the Kiskiminetas River at Vandergrift (Sta. 567) contained an average manganese concentration of 23.2 mg/l. High average manganese concentrations were found at Station 579 (29.8 mg/l) and Station 567 (23.2 mg/l) in the Conemaugh and Kiskiminetas River below Johnstown. Manganese concentrations in tributaries to the Conemaugh-Kiskiminetas mainstem averaged about one-tenth of the mainstem concentrations. The higher manganese levels in the mainstem below Johnstown are probably due to discharges from the steel industry.

The Conemaugh-Kiskiminetas River is an acid stream over its entire length and the river system is grossly polluted by coal mine drainage. Acid, sterile streams in this watershed are the rule and not the exception.

Although the Allegheny River possessed adequate dilution and neutralizing capability to assimilate mine drainage water received above the mouth of the Kiskiminetas River, the water quality is significantly degraded below this point. The Allegheny River at Natrona, Pennsylvania carried an average net acid load of 245 tons per day and had a pH range of 4.0 to 6.8. The total acidity concentration exceeded the alkalinity concentration during two thirds of the survey period. However, the acidity concentration was generally below 30 mg/l.

A one-year study during 1965-1966 conducted by the University of Pittsburgh for the Wheeling Field Office of The Environmental

Protection Agency measured an average net acid load of 384 tons per day discharged from the Kiskiminetas River and a net alkalinity load of 401 tons per day from the Allegheny River at Pittsburgh (4).

Water quality records show that acid conditions in the lower Allegheny River are particularly acute during periods of low flow when the percentage contribution of flow to the mainstem by the Kiskiminetas is greater than normal. When roughly 30 percent of the flow in the Allegheny is from the Kiskiminetas River, fish kills are expected. One million fish were killed in the Allegheny River below the Kiskiminetas due to acid conditions during the period August 19-23, 1966.

# INTRODUCTION

In the spring of 1967, several discussions were held between personnel of the Wheeling Field Office, Environmental Protection Agency, Wheeling, West Virginia, and personnel of the Pennsylvania Department of Environmental Resources (DER). These discussions developed into a cooperative State-Federal project to locate and quantify all significant sources of coal mine drainage in the principal problem areas of the Allegheny River basin. The first cooperative effort was developed in the Clarion River basin. The field work portion of this initial study was completed in the fall of 1967. In the spring of 1968, it was decided to continue the cooperative field effort in the Kiskiminetas River basin. Based on the available water quality data and the widespread severity of the mine drainage problem, it was decided to extend the field survey over the entire 1,892 square mile drainage area of the Kiskiminetas River.

For the purpose of aiding the field survey crews as well as aiding in the initial field reports, the Kiskiminetas River basin was delineated into seven separate sub-basin drainage areas. The seven sub-basin areas are shown on Figure 1. Pertinent data regarding these areas is shown below:

MINE DRAINAGE SURVEY AREAS

KISKIMINETAS RIVER BASIN

| Survey Area | Drainage Area (sq. miles) |
|---|---|
| Kiskiminetas River - mainstem and tributaries | 216 |
| Loyalhanna Creek | 300 |

| Survey Area | | Drainage Area (sq. miles) |
|---|---|---|
| Conemaugh River - mainstem and minor tributaries | | 310 |
| Blacklick Creek | | 222 |
| Two Lick Creek | | 190 |
| Little Conemaugh River | | 188 |
| Stony Creek | | 466 |
| | TOTAL | 1,892 |

Four two-man crews performed the field work during the study. Due to other work commitments, there were a few periods when the total field force was not in operation. However, all four field crews were in operation during most of the study period. The study began during the second week of April, 1968 and was completed during October 1968.

Field crew personnel were supplied on an equal basis by the EPA and the Commonwealth of Pennsylvania, i. e. four men each. The EPA personnel were all from the Wheeling Field Office, Wheeling, West Virginia. The Pennsylvania personnel were all from the Department of Environmental Resources Offices at Pittsburgh, Meadville, Lewistown, Williamsport, Kingston, and West Reading. Mine discharges were numbered consecutively by watershed as encountered. Field personnel prepared an inventory sheet for each sample taken describing the conditions found. Color photographs were taken to augment the descriptions of certain mine discharges.

Samples were taken for laboratory analysis of each mine discharge and selected surface streams. Conductivity, pH determinations and a flow measurement were made at the time of each sample collection. The samples were analyzed by laboratory facilities in the Wheeling Field Office for the additional parameters of total acidity, alkalinity, hardness, sulfate, total iron, manganese and aluminum. Approximately 950 samples were analyzed during the six-month intensive sampling period.

During the past several years, Pennsylvania has shown an increasing awareness of stream pollution resulting from the discharge of both active and abandoned coal mines. In 1965, Pennsylvania amended the existing Clean Streams Law for pollution control from active mines. In 1967, a Land and Water Conservation and Reclamation Bond Issue of 500 million dollars was approved. This bond issue allocated 150 million dollars for the abatement of mine drainage pollution from abandoned mines (5). The bond issue money is budgeted over a ten year period under the direction of the Department of Environmental Resources. In conjunction with the Clean Streams Law, the Commonwealth is in the position to direct pollution abatement activities toward the abandoned mine problem and also in the position to enforce effluent standards on the discharges emanating from active mines.

Present Commonwealth of Pennsylvania mine drainage pollution control regulatory authority is adequate to prevent additional stream quality degradation due to iron and acidity from active or future mining activities. Stream pollution resulting from operating coal mines in the Kiskiminetas River basin were quite significant during the period of survey. However, the amount of mine drainage pollution emanating from active operations has been significantly reduced by the installation of treatment facilities. It is the residual problem of drainage from abandoned mines that will require virtually all of the emphasis of any program of drainage abatement in the Kiskiminetas River basin.

The Commonwealth has developed their abandoned mine drainage program in four phases (6). The initial field inventory and documentation of existing pollution sources, as presented in this report, completes the Phase I (Pollution Source Inventory) portion of this program. Phase II (Engineering Studies and Plans) essentially incorporates the recommendations outlined in items 2, 3, and 4 as listed in an earlier section of this document. Phase III of this program includes construction while Phase IV is concerned with operation and maintenance of the physical structure.

As mentioned above, the mine drainage source inventory conducted during the cooperative study completes the Phase I portion of the abatement schedule outlined above. Since completion of the field inventory, the Commonwealth has initiated preliminary engineering studies (Phase II) and/or on a limited basis, construction (Phase III) in several of the inventoried Kiskiminetas River watersheds. These areas include Two Lick Creek, Loyalhanna Creek, Stony Creek, and Blacklegs Creek.

In preparation of the Kiskiminetas River mine drainage report, an attempt was made to update existing information on active mines in the basin. Contact was made with the appropriate Regional Office of the Pennsylvania Department of Environmental Resources relative to the active underground mines in their respective regions. This information, as supplied by these offices at the time of request, has been included in the sub-basin reports. No attempt was made to include active mines which have been developed since 1968. As a result of the nature of such mining, no attempt was made to update information concerning surface mines which were active at the time of survey.

## PURPOSE AND SCOPE

The purpose of this report is to provide basic data concerning sources of coal mine drainage in critical problem areas of the Kiskiminetas River basin. Information regarding the location, physical characteristics, and quantity and quality of point sources is requisite to the development of a program to reduce or eliminate the deleterious water quality affects of mine drainage.

The objectives of this report are to:

1. Describe the significance and impact of water quality impairment by coal mine drainage in the Kiskiminetas River basin.
2. Identify and characterize the tributary watersheds contributing significant amounts of acidity and related constituents to the Kiskiminetas River.
3. Relate mine drainage contributions of sub-watersheds to the mainstem of the receiving stream.
4. Inventory the sources of coal mine drainage, by watershed, in terms of salient characteristics and quantity and quality of discharge.
5. Isolate and identify the principal pollution sources in each watershed unit studied.
6. Outline essential steps in a mine drainage abatement program.

Descriptions of seven inventoried watersheds of the Kiskiminetas River basin are contained in the following sections of this document. There are seven separate sections, one pertaining to each watershed. Each section contains its own summary and conclusions, maps, water quality data, and related mine drainage information. Analyses for the individual discharging mine sites are shown in the appendices. A separate appendix is included for each of the individual watershed study areas.

Abating pollution from inactive mines is a task the cost and success of which are difficult to predict at this time with reasonable accuracy. The difficulty stems from the fact that there is little experience with watershed-scale abatement projects upon which to base estimates.

It is the general conclusion of this report that the development of meaningful cost estimates for the abatement of mine drainage pollution in the Kiskiminetas River basin is sufficiently complex to warrant a separate engineering-economic study. No attempt has been made to suggest order-of-magnitude cost estimates for the study area.

A preliminary and relatively short-term survey, such as reported herein, is qualitative but results in limited quantitative conclusions. The chemical loadings of mine drainage parameters measured in the mine discharges and the pollutional effects of these loadings measured in the receiving streams are representative of the time of survey. These loading figures do not reflect permanent or established conditions and will exhibit widely varying rates at different periods of hydrologic conditions. The acquired data is significant in that it provides a preliminary basis for further studies. The recommendations leading to an action program of mine drainage pollution abatement stated in this document are based upon this data.

## GEOLOGY AND GROUND WATER

The eastern part of the Kiskiminetas River basin has a distinctive series of northeast-trending anticlinal ridges, which are the chief physiographic features. Toward the center or axis of these major structures, the rocks are progressively older. The axial centers are principally rocks of the Pocono Formation which are flanked on both the east and west by succeedingly younger rocks of the Mauch Chunk, Pottsville, Allegheny, and Conemaugh Formations. Along the axial centers of major synclinal structures in the western part of the basin, the Monongahela Formation forms the land surface.

Principal rock types of these water-bearing rock units are sandstone conglomerate, shale, minor beds of limestone, and a few bituminous coal beds of commercial importance. In general, the thick conglomeratic sandstones are the best sources of ground water. The history of development of ground water supplies shows that valleys are hydrologically more favorable than hilltops for satisfactory wells.

Adequate supplies of ground water are available in the basin to meet most of the needs for the present and the forseeable future. Development of ground water has not been intense and many areas are practically untapped. The quantity of ground water withdrawn is actually only a fraction of the total available supply. Principal developments for communities and industries have been in the extensive permeable sandstone aquifers that crop out or that lie within 300 to 400 feet of the land surface. The most favorable areas for development of relatively large ground water supplies are underlain by massive coarse-grained conglomeratic sandstones of the Allegheny, Pottsville, and Pocono Formations. These rocks, which underlie somewhat less than half the basin area, yield large quantities of fresh ground water of good quality. Yields of wells range from 50 to as much as 600 gallons per minute (gpm).

The rocks of the Monongahela Formation do not yield large quantities of ground water to wells. However, these aquifers are developed because they are the only practical source of water supply for rural residents, dairy farms, and business firms not served by central public supply systems. Yields of wells tapping these rocks range from 1 to 20 gpm.

More than half the basin is underlain by rocks of the Conemaugh Formation, which is an important source of ground water. Yields of 20 to 150 gallons per minute are common for individual wells developed in favorable hydrogeologic areas.

Figure 2 is a small scale generalized map showing the potential ground water resources, based on information that is presently available. However, major ground water developments for communities and industries at specific sites usually require detailed studies and exploratory drilling to fully define the hydrologic characteristics of the water-bearing rocks. In the first stages of developing large supplies, all wells must be considered as test wells until their ultimate capacity is established by controlled pumping tests.

In general, the chemical quality of the ground water in the basin is much better than the chemical quality of the streams. The ground water is, with some exceptions, satisfactory for most ordinary uses with little or no treatment or disinfection. In some places, however, the iron content and hardness is high enough to require some treatment in both private and public supplies. Chloride content is usually low in shallow aquifers, but at depths of several hundred feet below the major streams chloride content can be quite high in some areas.

In certain localities, ground water of better chemical quality can be obtained by drilling to an alternate aquifer, but detailed study of local geologic conditions certainly is necessary to determine the most favorable aquifers and well development procedures. Available water-treatment methods can alleviate most of the ground water quality problems.

Coal mining can affect the local occurrence of ground water, but the total basinwide effect is apparently negligible. Mined areas act as additional drainageways for the discharge of ground water and, in a few local places, apparently have caused a lowering of water levels. The effects of mining on the chemical quality of the ground water apparently does not extend much beyond the immediate area of mining activities.

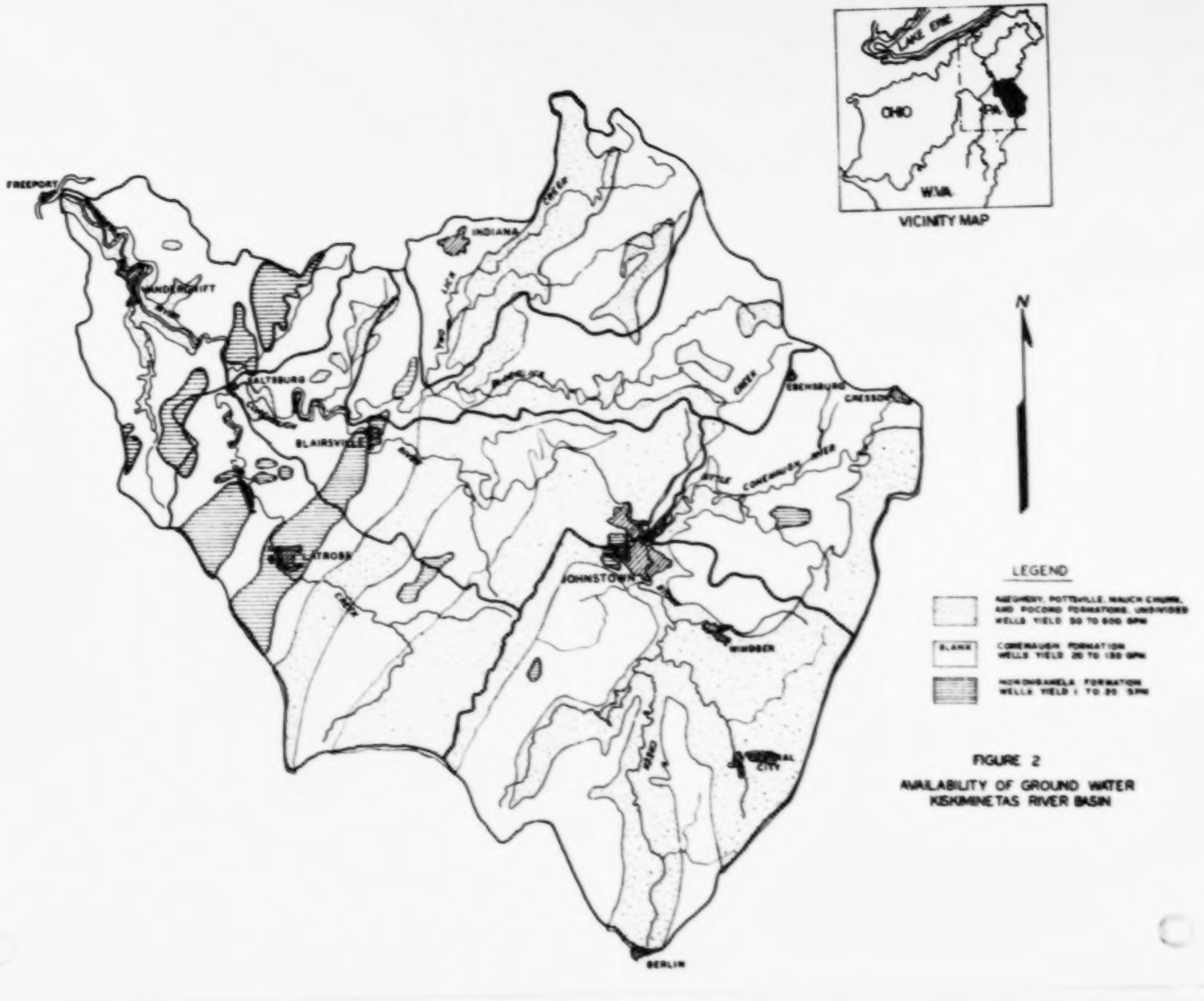
VICINITY MAP
LAKE ERIE
OHIO
PA.
W.VA.
N
FREEPORT
VANDERGRIFT
SALTSBURG
BLAIRSVILLE
LATROBE
INDIANA
CREEK
EBENSBURG
CRESSON
LITTLE CONEMAUGH RIVER
JOHNSTOWN
WINDBER
CENTRAL CITY
BERLIN
LEGEND
ALLEGHENY, POTTSVILLE, MAUCH CHUNK, AND POCONO FORMATIONS, UNDIVIDED WELLS YIELD 50 TO 500 GPM
BLANK
CONEMAUGH FORMATION WELLS YIELD 20 TO 150 GPM
MONONGAHELA FORMATION WELLS YIELD 1 TO 20 GPM

FIGURE 2

AVAILABILITY OF GROUND WATER
KISKIMINETAS RIVER BASIN

# COAL MINING

The counties comprising the Kiskiminetas River basin have been among the most significant coal producing areas in the Commonwealth. During 1968, these Counties, Armstrong, Cambria, Indiana, Somerset, and Westmoreland produced 28 million tons of soft coal. The greatest production was nearly eight million tons in Cambria County while Westmoreland County produced the least with three million tons (7).

## Armstrong County

Armstrong County has been a significant coal producing area for many years. There are about twenty coal beds in Armstrong County. During 1968, production was reported from six major seams. These included Middle and Upper Kittanning, Lower and Upper Freeport, Mahoning, and the Pittsburgh Coal seams. Coal production totalled 6.6 million tons with deep mine production equalling about two-thirds of the total production.

Coal reserves in Armstrong County are contained principally in two seams. These are the Upper Freeport and Lower Kittanning. Reserves contained in beds of less economic significance include the Pittsburgh, Lower Freeport, Upper and Middle Kittanning, and Clarion seams. In total, it has been estimated that Armstrong County contains approximately 500 million tons of recoverable coal reserves. This reserve is contained in beds 28 inches or more thick (8).

## Cambria County

There are 24 recognizable coal beds in Cambria County. The County is, and has been in the past, one of the largest coal producing areas in the state. The Lower Kittanning coal is probably the most persistent bed in the county. Many of the large active deep mines in Cambria County are in the Lower Kittanning seam. Other important coal seams in the county include the Upper Kittanning, Lower Freeport, and Upper Freeport. During 1968, production was also reported in the Middle Kittanning and Brookville seams. It has been estimated that this county contains more than 800 million tons of recoverable coal reserves in beds 28 inches or more thick (9).

## Indiana County

During 1968, production was reported from five coal beds in Indiana County. These beds included Lower and Upper Kittanning, Lower and Upper Freeport, and the Pittsburgh coals. The Lower Kittanning and Upper Freeport seams are the most economically important. In 1968, county production totalled 6.6 million tons. Surface mining methods contributed only about 0.8 million tons of this figure.

Major coal reserves in Indiana County are contained in eight seams. However, the Lower Kittanning and Lower and Upper Freeport seams are the most significant and contain the major portion of the reserve. Recoverable reserves in beds 28 inches and more thick are estimated at 900 million tons (10).

## Somerset County

Production was reported from ten coal seams in Somerset County during 1968. These included Clarion, Lower, Middle and Upper Kittanning, Lower and Upper Freeport, Brush Creek, Pittsburgh, Redstone, and the Sewickley coal beds. The Upper and Lower Kittanning seams are among the most important. In 1968, county production totalled about four million tons. Surface mining methods accounted for about 60 percent of the total production.

Recoverable coal reserves in Somerset County are contained in the following seams: Upper Kittanning, Lower Kittanning, Upper Freeport, Lower Freeport, Middle Kittanning, Clarion, Pittsburgh and Redstone. The order of listing also designates the order of importance assigned to these seams. The Pittsburgh and Redstone contain only a very minor portion of the total reserve. Recoverable reserves 28 inches or more thick in Somerset County are estimated at 700 million tons. (11)

## Westmoreland County

There are sixteen coal beds of minable thickness in Westmoreland County. In 1968, production was reported in the Lower and Upper Freeport, Pittsburgh, and Redstone coal seams. In 1968, county production totalled about three million tons. Surface mining methods produced less than one-quarter million tons.

From the standpoint of reserves, there are two major coal beds in Westmoreland County. These are the Pittsburgh and Upper

Freeport. The Waynesburg, Redstone, Lower Freeport, and Lower Kittanning are of only minor importance. In beds 28 inches and more thick, it is estimated that the recoverable coal reserve in Westmoreland County is in excess of 825 million tons (12).

Total recoverable coal reserves in the five county area comprising the Kiskiminetas River basin are estimated in excess of 3,700 million tons. A substantial portion of this reserve is located outside the basin boundary. However, that portion of the reserve within the Kiskiminetas River drainage area is more than adequate to insure steady and continued mining for many years.

# KISKIMINETAS RIVER, MAIN STEM AND MINOR TRIBUTARIES
# MINE DRAINAGE INVENTORY

# KISKIMINETAS RIVER, MAIN STEM AND MINOR TRIBUTARIES

## MINE DRAINAGE INVENTORY

## SUMMARY AND CONCLUSIONS

1. The main stem Kiskiminetas River and its minor tributaries drain an area of 216 square miles. The entire length of the Kiskiminetas River between its formation at Saltsburg to its confluence with the Allegheny River at Schenley, Pennsylvania is seriously polluted as a result of coal mine discharges. This water quality degradation results from discharges within the drainage boundary as well as from massive amounts of mine drainage inflow contributed by Loyalhanna Creek and the Conemaugh River.

2. A total of 89 discharging sources and approximately 1,475 acres of surface mined area were investigated in the study area. Discharges from the coal mine sources ranged from one to 1,008 gpm and totalled nearly 6.4 million gallons per day (mgd). The total net acid load discharged by the 89 sources was 57,880 lb/day.

3. At the time of the survey, active operations were limited to two drift mines. At the time of sampling, one of the active mines contributed an acid load of 3,360 lb/day (Mine No. 5871). However, treatment facilities have since been installed at this mine and it is reported that the treatment facility operates within the standards imposed by the Commonwealth of Pennsylvania. The second mine was not operating at inspection and at that time contributed only a negligible discharge.

Refuse piles and abandoned drift mines were the major sources of pollution in the study area. These sources contributed about 85 percent of the total net acid load discharged by all sources in the watershed.

4. A total of 17 principal sources of mine drainage discharge were located in the study area. These sources discharged a total net acid load of 46,613 lb/day. This represents about 81 percent of the acid load discharged by all sources in the watershed.

## DESCRIPTION OF AREA

The Kiskiminetas River is formed by the confluence of the Conemaugh River and Loyalhanna Creek at Saltsburg, Pennsylvania. From this point the River flows generally northwest through the communities of Apollo, Vandergrift, and Leechburg, to its confluence with the Allegheny River at Schenley. The river is approximately 27 miles in length and drains an area of 216 square miles.

Beaver Run and Blacklegs Creek with drainage areas of 55 square miles and 45 square miles respectively, are the principal tributaries to the main stem Kiskiminetas River.

## STREAM WATER QUALITY

Due to the grossly polluted acid condition of both Loyalhanna Creek and the Conemaugh River, the Kiskiminetas River exhibits similar water quality conditions over its entire length. Particularly in the Saltsburg area, the river carries the characteristic iron discoloration of mine drainage waters. The river bed and high water levels are heavily stained and coated with precipitated iron compounds. Alkaline tributary inflow entering the river below Saltsburg is immediately assimilated with no noticeable water quality improvement in the main stem.

During the course of the field study several stream locations were sampled for chemical analysis (Table 3, Figure 3). These stations were selected to measure the cumulative effects of mine drainage. A summary of the stream data is presented in Table 4. The water quality data collected below the Conemaugh and Loyalhanna Reservoirs are also included in this data summary. This data reflects the background water quality of the tributaries which form the Kiskiminetas River.

All but one of the above streams are affected by mine drainage discharges to some degree. Roaring Run is the one exception. Although there are extensive underground mining operations in the immediate area of Roaring Run, there are no significant mine effluents discharged directly to the stream. However, Roaring Run is affected and similar in appearance to the many mine drainage degraded streams in the surrounding vicinity. Near its lower reach the tributary is in continual contact with a coal seam which outcrops in the stream bed. From this point to its confluence with the Kiskiminetas River the stream is highly discolored.

## TABLE 3

### Stream Water Quality Sampling Stations
### Kiskiminetas River, Main Stem and Minor Tributaries

| Station No. | Sampling Period | Stream | Location |
|---|---|---|---|
| 5619 | Oct, Nov, Dec, 1968 | Conemaugh River | USGS gage below reservoir |
| 5292 | July, Oct, Nov, 1968 | Loyalhanna Creek | USGS gage below reservoir |
| 5617 | Oct, Nov, Dec, 1968 | Wolford Run | Near mouth |
| 5206 | May, June, 1971 | Blacklegs Creek | Near mouth |
| 5618 | Oct, Nov, Dec, 1968 | Sulphur Run | Near mouth |
| 5626 | Nov, Dec, 1968 | Roaring Run | Near mouth |
| 5627 | Nov, Dec, 1968 | Beaver Run | Near mouth |
| 5628 | Nov, Dec, 1968 | Kiskiminetas River | Vandergrift, Pa. |
| 5629 | Nov, Dec, 1968 | Kiskiminetas River | Near mouth |

## TABLE 4

Stream water quality data
Kiskiminetas River, main stem and minor tributaries

| Station No. | Sampling Date | Flow (gpm) | pH | Specific Conductance | Total Acidity mg/l | Total Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5619 | 10/20/68 | 99,000 | 3.2 | 1,400 | 265 | 314,820 | 242 | 287,496 | 500 | 594,000 | 11.1 | 13,187 | 1.9 | 2,257 | 5.9 | 7,009 |
| " | 11/13/68 | 446,000 | 3.6 | 700 | 120 | 642,240 | 135 | 722,520 | 210 | 1,123,920 | 14.2 | 75,998 | 3.4 | 18,197 | 7.1 | 37,999 |
| " | 12/4/68 | 850,000 | 5.3 | 490 | 125 | 1,275,000 | 88 | 897,600 | 185 | 1,887,000 | 8.9 | 90,780 | 1.3 | 13,260 | 5.2 | 53,040 |
| 5292 | 7/11/68 | 409,500 | 3.2 | 2,100 | 170 | 835,380 | 400 | 1,965,600 | 475 | 2,334,150 | 5.0 | 24,570 | 5.2 | 25,553 | 4.7 | 23,096 |
| " | 10/30/68 | 7,200 | 3.3 | 1,350 | 270 | 23,328 | 340 | 29,376 | 720 | 62,208 | 4.5 | 562 | 4.6 | 397 | 3.1 | 268 |
| " | 11/13/68 | 72,000 | 3.1 | 1,200 | 164 | 141,696 | 304 | 262,656 | 435 | 375,840 | 9.2 | 7,949 | 3.7 | 3,197 | 3.1 | 2,678 |
| 5617 | | 500 | 2.6 | 8,000 | 1320 | 7,920 | 260 | 1,560 | 1350 | 8,100 | 179.5 | 1,077 | 15.7 | 94 | 67.5 | 405 |
| " | 11/20/68 | 4,124 | 3.2 | 1,250 | 450 | 22,270 | 118 | 5,840 | ---- | ------- | 88.0 | 4,355 | 9.6 | 475 | 20.5 | 1,015 |
| " | 12/ 4/68 | 15,879 | 4.5 | 700 | 210 | 40,015 | 86 | 16,387 | 230 | 43,826 | 40.0 | 7,622 | 2.9 | 553 | 10.5 | 2,001 |
| 5206 | 5/24/71 | 14,438 | 5.7 | 580 | 84 | 14,545 | 230 | 39,826 | 350 | 60,605 | 5.0 | 866 | 1.0 | 173 | 9.3 | 1,610 |
| " | 6/ 3/71 | 11,677 | 5.6 | 650 | 23 | 3,223 | 31 | 4,344 | 400 | 56,050 | 4.5 | 631 | 1.0 | 140 | 9.0 | 1,251 |
| 5618 | 10/30/68* | 120 | 2.7 | 2,250 | 835 | 1,202 | 436 | 628 | 1200 | 1,728 | 15.4 | 22 | 12.8 | 18 | 55.6 | 80 |
| " | 11/20/68 | 130 | 2.9 | 2,000 | 702 | 1,095 | 416 | 649 | ---- | ------ | 15.7 | 25 | 9.7 | 15 | 35.0 | 55 |
| " | 12/ 4/68 | 300 | 3.8 | 1,250 | 450 | 1,620 | 306 | 1,101 | 825 | 2,970 | 9.7 | 35 | 7.6 | 27 | 26.1 | 94 |
| 5626 | 11/ 1/68 | 385 | 4.3 | 1,200 | 262 | 1,210 | 264 | 1,220 | 450 | 2,079 | 3.2 | 15 | 3.2 | 15 | 7.6 | 35 |
| " | 11/20/68 | 3,505 | 3.5 | 750 | 152 | 6,393 | 115 | 4,837 | ---- | ------ | 26.6 | 1,119 | 1.7 | 72 | 3.7 | 156 |
| " | 12/ 4/68 | 16,789 | 5.7 | 400 | 106 | 21,355 | 112 | 22,564 | 110 | 22,161 | 7.0 | 1,410 | 1.6 | 322 | 3.8 | 765 |
| 5627 | 11/ 1/68 | 2,200 | 4.2 | 1,300 | 151 | 3,986 | 202 | 5,333 | 260 | 6,864 | 2.5 | 66 | 3.0 | 79 | 5.1 | 135 |
| " | 11/20/68 | 7,065 | 5.5 | 775 | 80 | 6,782 | 148 | 12,547 | ---- | ------ | 4.8 | 407 | 1.8 | 153 | 4.6 | 390 |
| " | 12/ 1/68 | 14,800 | 7.3 | 600 | 88 | 15,628 | 128 | 22,732 | 265 | 47,064 | 5.4 | 959 | 1.7 | 302 | 3.5 | 621 |
| 5628 | 11/ 1/68 | 144,000 | 3.8 | 1,400 | 245 | 423,360 | 222 | 383,616 | 585 | 1,010,880 | 11.8 | 20,390 | 3.6 | 6,220 | 7.7 | 13,305 |
| " | 11/20/68 | 1,242,000 | 4.3 | 580 | 82 | 1,222,128 | 91 | 1,356,264 | ---- | ------ | 0.8 | 11,923 | 1.4 | 20,865 | 3.7 | 55,144 |
| " | 12/ 4/68 | 981,000 | 4.6 | 650 | 150 | 1,765,800 | 93 | 1,094,796 | 255 | 3,001,860 | 16.5 | 194,238 | 1.7 | 20,012 | 6.0 | 70,632 |
| 5629* | 11/ 1/68 | ------- | 3.8 | 1,400 | 425 | ------- | 234 | ------- | 570 | ------- | 18.1 | ------ | 3.6 | ------ | 10.3 | ------ |
| " | 11/20/68 | ------- | 3.7 | 600 | 106 | ------- | 96 | ------- | ---- | ------- | 11.8 | ------ | 1.3 | ------ | 4.7 | ------ |
| " | 12/ 4/68 | ------- | 4.9 | 600 | 130 | ------- | 97 | ------- | 290 | ------- | 11.8 | ------ | 1.8 | ------ | 5.9 | ------ |

* Sample collected from railroad tressel near mouth of Kiskiminetas River.    No flow measurement obtained.

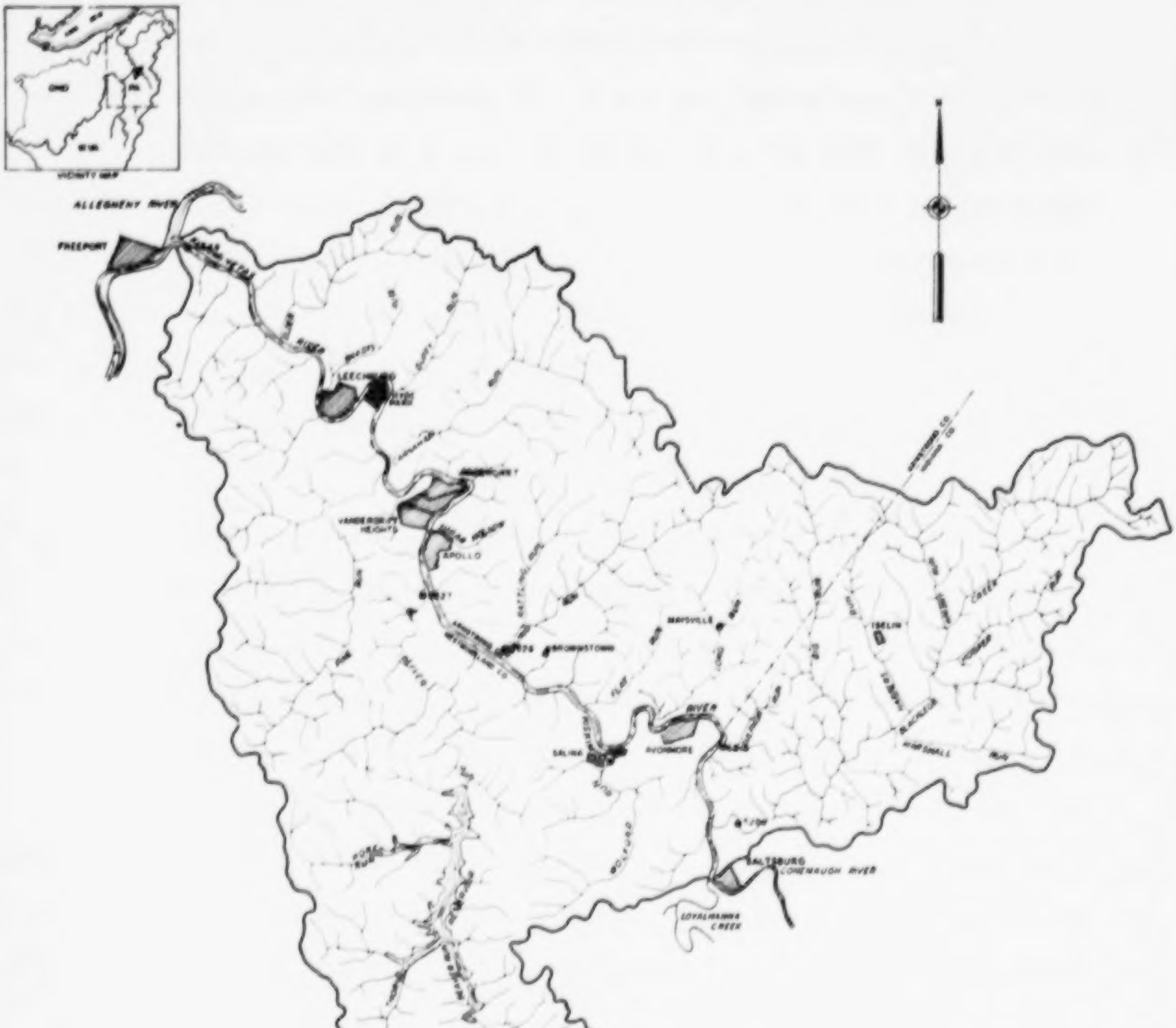
VICINITY MAP
OHIO
PA.
W.VA.
ALLEGHENY RIVER
FREEPORT
KISKIMINETAS
RIVER
LEECHBURG
VANDERGRIFT
VANDERGRIFT HEIGHTS
APOLLO
BROWNSTOWN
MAYSVILLE
ISELIN
RIVER
SALINA
AVONMORE
SALTSBURG
CONEMAUGH RIVER
LOYALHANNA CREEK
CREEK
LEGEND
● STREAM WATER QUALITY SAMPLING LOCATIONS

FIGURE 5

KISKIMINETAS RIVER MAINSTEM AND MINOR TRIBUTARIES
STREAM WATER QUALITY SAMPLING LOCATIONS

The 45 square mile drainage area of Blacklegs Creek was not included during the 1968 field inventory of the Kiskiminetas River basin. There were several reasons for its exclusion. During 1966 the Blacklegs Creek drainage area was selected as an area representative of coal mine drainage problems in the Allegheny River basin. As a result of this selection, a field investigation in this area was conducted during the summer of 1966. During the 1968 cooperative study, it was decided that a reinvestigation of Blacklegs Creek would be conducted only if sufficient time was available. Since this was not the case, the area was deleted from study. In preparation of this report, it was decided that a limited reinvestigation should be conducted in the Blacklegs Creek drainage area. In May of 1971, a three-day survey was performed in order to determine the current status of coal mine operations on Blacklegs Creek. At this time, it was determined that the stream water quality, number and type of discharging mines, active mines, etc., had not been significantly altered since the 1966 study. As a result, except where noted in the following text, the Blacklegs Creek mine drainage data reflects the conditions as measured during 1966.

## SOURCES OF MINE DRAINAGE

Approximately 150 mining sites and an estimated 1,475 acres of strip mined area were investigated in this study. Samples for chemical analysis were collected from 89 sources discharging at the time of the survey. The total effluent volume from all sources was 4,439 gpm or 6.4 million gallons per day (mgd). The total net acid load discharged to the main stem Kiskiminetas River and its tributaries was 57,880 lb/day.

A description of the mine drainage sources follows. All mine site locations inventoried in this area are shown in Figure 4.

## Main Stem - Unnamed tributaries below Saltsburg

Approximately 0.9 mile below the formation of the Kiskiminetas River, several small unnamed tributaries enter the main stem. Seven underground and four surface mines were inventoried on these small tributaries. Discharges were located at three of these sites. Mine No. 5537 was an inactive drift mine located near the headwaters of one tributary. This mine contributed a 12 gpm discharge which carried an acid load of 399 lb/day. The second discharge (Mine No. 5539) was located at the base of a highwall in a strip mined area. It appeared that this area may have been drift mined prior to the surface operation. The acid load was 62 lb/day. A 45 gpm effluent was sampled at Mine No. 5538, an abandoned drift mine. The acid load was 508 lb/day.

## Blacklegs Creek

Only a limited number of surface mines were investigated along the north side of Blacklegs Creek below Big Run. These surface mines, as well as several underground mine openings, were dry.

Three discharges on Big Run are responsible for the major portion of the total acid mine drainage load discharged in the Blacklegs Creek watershed. These sources include Mine No.'s 604, 605 and 5207.

Mine No. 604 is located adjacent to the gravel road which runs along Big Run. The actual discharge point is below the road bed almost at stream level. At road level only a slight hillside depression indicates the possible presence of the old drift opening. The measured effluent was 324 gpm which carried an acid load of 1,750 lb/day.

Approximately 0.5 mile upstream of Mine No. 604 a second major source of mine acid discharge was located on a small unnamed tributary to Big Run. This was Mine No. 5207. This site was not located during the initial 1966 survey and was found and sampled for the first time in May 1971. It was not determined if this site represents a mine opening or a breakout point from an underground mine located elsewhere in the general area. The 310 gpm effluent carried an acid load of 1,618 lb/day.

Mine No. 605 is the third major source of mine drainage discharge on Big Run. The measured effluent was 675 gpm and carried an acid load of 3,443 lb/day. An additional acid load of 450 lb/day was received by Big Run from Mine No. 606 located almost directly across from Mine No. 605.

Extensive mine operations were at one time operative near the community of Iselin on Harpers Run. All that presently remains are large gob piles and several miles of unreclaimed contour surface mines. During 1966 two minor sources of acid discharge were collected from one of the mine refuse dumps. In the later (1971) reinvestigation of the area these two sources were not located. The failure to relocate these sources could be a hydrologic function but more likely these two effluents may have been abated by an Operation Scarlift program which has occured during the five year interval. The Scarlift program was directed toward extinguishment of a fire burning in one of the refuse dumps. The subsequent covering of portions of the pile may have eliminated the discharges.

The headwater area of Whiskey Run has been extensively mined. A total of 21 samples were collected, 14 of which were discharging at the time of inspection. Mine No. 631 was the only significant source of acid discharge located in the Whiskey Run drainage area. This mine is one of several openings in the immediate area; however, the others were dry. The 60 gpm effluent from Mine No. 631 carried an acid load of 396 lb/day.

The last significant mine discharge in the Blacklegs Creek area was located on an unnamed tributary near the headwaters of the stream. At this site (Mine No. 646) an effluent of 1,008 gpm was discharged to the receiving tributary. The alkalinity concentration of the effluent was 267 mg/1 with a resultant alkaline load of 3,330 lb/day. Although alkaline, the discharge is grossly discolored and as a result several miles of downstream Blacklegs Creek are similarly discolored.

## Sulphur Run

The 1.8 square mile drainage area of Sulphur Run is polluted by mine drainage over much of its length. Several very old underground mines have been located on the tributary. Six surface mines were also inspected. Four point source discharges were located. Each of the discharge points appear to represent old mine openings; however, the surface mines may have created additional openings when they intersected the mine voids. A considerable amount of mine refuse is scattered about the area and is in contact with several hundred yards of main stem Sulphur Run. The acid load discharged by the four sources totalled 503 lb/day (Mine No.'s 5878, 5879, 5880; and 5881). One active strip mine was investigated; however, it was dry.

Stream sampling at the mouth of Sulphur Run (Station No. 5618) indicated acid load values ranging from 1,200 lb/day to 1,600 lb/day (Table 3). It is readily apparent that the stream carried acid loads far in excess of the load values contributed by the mine discharges. This is due to the numerous small seepage areas in the watershed which were not measureable and therefore not directly quantifiable.

## Long Run

This tributary drains an eight mile area north of Avonmore on the opposite side of the river. A few abandoned surface and underground mines as well as one active underground mine were inventoried on this tributary. The surface mines in the area are associated with small drift mines. Two of these abandoned combination mines were discharging and contributed a total acid load of 29 lb/day (Mine No.'s 5873,5874).

The active David mine of Canterbury Coal Company was located north of Maysville. At the time of inspection a 400 gpm discharge was sampled. The acid load carried by this effluent was 3,360 lb/day. However, treatment facilities were nearly complete on the sampling date. At the present time these facilities are in operation. The treatment supplied is generally adequate; however, the discharge rate has occasionally exceeded the capacity of the treatment facility. As a result the final effluent has not always met effluent standards required by Pennsylvania for active mine discharges. It has been reported that the company has applied for a new permit for an additional borehole and treatment facility to alleviate the present overload.

Another active drift mine was located along the bank of the Kiskiminetas River approximately 0.5 mile below the confluence of Long Run. The mine was not operating at the time of inspection and there was no discharge from the opening at this site. This mine was under ownership by the Altmire Brothers Coal Company.

## Wolford Run

On the opposite bank of the river, Wolford Run was the next downstream tributary affected by mine drainage discharges. The tributary drains 9.8 square miles and enters the river near the community of Salina. The stream is degraded in the headwater area and remains so along its entire downstream length.

Five mine discharges were sampled in the headwater area. These discharges resulted from a combination of both surface and underground mine operations. The total discharge was 53 gpm and the acid load was 1,119 lb/day (Mine No.'s 5530, 5531, 5532, 5533, 5534). Along the mid-reach of the stream a series of combination surface and underground mines discharged high acid loads. Mine No.'s 5535, 5536, and 5537 contributed an acid load of nearly 1,700 lb/day. There were no additional mine effluents draining to Wolford Run. However, large mine refuse areas near Salina contributed significant amounts of acidity through sub-surface seepage directly to Wolford Run.

During the course of the field study Wolford Run was sampled for water quality analysis on three occassions (Table 3). On each occassion the water quality was highly degraded as a direct result of abandoned mine discharges. The acid load measured near the mouth of the stream ranged from 8,000 lb/day to a maximum of 40,000 lb/day.

Two additional discharge points were located in the immediate area. Mine No.'s 5540 and 5541 are located along the bank of the river just downstream of Salina. Due to their proximity these openings may have been interconnected with the mine at Salina or may have served as drainage points for the mine. The combined acid load carried by these discharges was 369 lb/day.

## Kiskiminetas River, mainstem - Brownstown area

Mining operations along both banks of the Kiskiminetas River in the Brownstown area have been extensive. Thirteen mine and mine associated discharges were located in this area. The cumulative acid load discharged directly to the river by these sources was nearly 35,000 lb/day. This represents about two-thirds of the total acidity discharged from all sources in the Kiskiminetas River mainstem area.

The Leechburg Mining Company operates an active drift mine at Brownstown. Although there are numerous abandoned mine discharges in the immediate area, there were no discharges emanating directly from this mine. The Commonwealth of Pennsylvania regards the mine as dry and does not attribute any of the surrounding discharges to the active operation. A very large refuse area is associated with this mine. The refuse is trucked to the hilltop and scattered over approximately 100 acres. At the time of inventory numerous immeasurable seepage areas were observed along the bottom edge of this waste pile. In addition to these seepage areas a total of five discharges were directly attributed to the pile. The combined acid load contributed by these discharges was 22,435 lb/day (No.'s 5584, 5588, 5590, 5591, and 5592). The seepage areas and discharge points have destroyed trees and other vegetation as the highly mineralized water flows over the hillside to the Kiskiminetas River some 400 feet below. One additional sample of refuse pile drainage was found upstream of the Brownstown complex. The acid load was 78 lb/day (No. 5587).

Six discharges of underground origin were also located in the Brownstown area. It is difficult to determine the number of drift mine openings in the area but it appears that there have been several openings in at least three different coal seams. Discharging underground mine sites contributed an acid load in excess of 12,000 lb/day (Mine No.'s 5542, 5543, 5582, 5583, 5585, 5586, and 5589). The major portion of this load was discharged by No.'s 5583 and 5589. Mine No. 5583 was a partially open drift mine with a flow rate of 80 gpm. The 195 gpm discharge at No. 5589 emanates from the base of a caved opening about 60 vertical feet above the river. The opening may have served as a fanway or drainway for the nearby mines.

### Roaring Run

This tributary drains a 14 square mile area and joins the Kiskiminetas River about 1.5 miles downstream of Brownstown. As mentioned in an earlier section of this document, the water quality of Roaring Run is degraded due to a coal outcrop in the stream bed near its lower end. Approximately twelve strip mines and seven drift openings wer located within the drainage area of the tributary. All but one of these operations were dry. Mine No. 5876 contributed an acid load of only 5 lbs/day. The mine appeared to be an active operation; however, a local resident stated that the mine had worked on only a limited basis since it was opened. Two additional drift mines were in operation on Roaring Run. These were the Casella Bros. and Swiss Coal Company mines. Both operations were dry. The status of the Casella mine is not known but it has been reported that the Swiss mine has been closed since the date of inventory.

Stream sampling and gaging at the mouth of Roaring Run (Station No. 5626) indicated acid load values ranging from 1,210 lbs/day to 21,355 lbs/day. (Table 3). On each occasion, the alkalinity concentration was depleted to zero and other mine drainage parameters including iron, manganese, and aluminum were high.

## Beaver Run

Approximately 40 surface mines and 15 underground mine openings were located within the 55 square mile drainage area of Beaver Run. The tributary joins the Kiskiminetas River just above the community of Apollo and on the opposite bank. The large Beaver Run Reservoir is located within this sub-basin. The reservoir is for water supply and pumps via aqueduct to communities outside the Kiskiminetas River drainage area.

The first source of mine drainage pollution to enter Beaver Run was located on an unnamed tributary west of the junction of Routes 66 and 22. In this area a 2 gpm discharge was collected at the base of a refuse pile. The acid load discharged by this source (No. 5604) was only 8 lb/day.

A series of surface and underground mines were located on the east bank of Beaver Run and on Porters Run along the eastern finger of the reservoir. The only mine which contributed a significant discharge was No. 5550. The source of this discharge was cumulative seepage along the bottom edge of a strip mine.

The major portion of the discharging mine sites located in the headwaters of Beaver Run were found along Thorn Run. Thorn Run forms the western finger of the reservoir. Seven discharging sites were located. The combined flow was 32 gpm and the acid load totalled 949 lb/day. (Mine No.'s 5605, 5606, 5607, 5612, 5613, 5614, and 5615). Mine No. 5612 contributed nearly one-half of the total acid load. At this site an old drift portal has been stripped out and covered over by the backfill of the surface mine. However, at the base of the backfill a 5 gpm discharge was located. The acid load was 444 lb/day. Additional significant acid loads were discharged by Mine No.'s 5605 and 5607. Mine 5605 was a partially open drift mine (119 lb/day) and the discharge from Mine No. 5607 resulted from seepage along the bottom edge of a surface mine (194 lb/day). One surface mine was in operation on Thorn Run during the survey but was dry.

With the exception of the mine described on the headwaters of Beaver Run and Thorn Run, there were no additional mining operations on any tributaries draining directly to Beaver Run Reservoir. All remaining operations were located below the drainage area of the reservoir.

Immediately below the reservoir an acid load of 3,167 lb/day was discharged to Beaver Run by two drainage sources. (Mine No.'s 5547, and 5548). These sources were located within a strip mined area below the reservoir filtration plant. At least one drift opening and possible others were located in the base of the highwall. The drift mouth was dry; however, discharges emanating from the base of the highwall were located on both sides of the portal. The discharge from Mine No. 5548 was 110 gpm and carried an acid load of 2,904 lb/day. The acid load from No. 5547 was 263 lb/day. The last significant acid load discharged to Beaver Run was from Mine No. 5546. At this point cumulative seepage from a strip mined area discharged an acid load of 259 lb/day.

Stream sampling near the mouth of Beaver Run (Station No. 5627) indicated acid load values ranging from 3,986 lb/day to 15,628 lb/day (Table 3).

## Kiskiminetas River, Apollo to mouth

There were only a limited number of mining operations located along the remaining downstream length of the Kiskiminetas River or its minor tributaries.

One drainage source was located on Sugar Hollow which joins the main stem in the community of Apollo. A 5 gpm flow which carried an acid load of 80 lb/day was located in this area. The discharge originates in a small gully on the south side of Route 56. There is some coal refuse scattered about but it was difficult to determine if a mine was once located here or whether the gully was simply a convenient dumping location. If the latter is the case, it may be that a small hillside spring is percolating through the refuse and becoming degraded. The drainage is then piped under Route 56 and into Sugar Hollow.

The next downstream area affected by mine drainage was Pine Run. The tributary drains an area of 18 square miles but the mine operations had been limited to the area just above its mouth. Four discharges were located along the banks of the tributary. A strip mine extends several hundred yards along one bank of the tributary. It appears that this operation has completely destroyed or covered the portal to an underground mine operation. In addition, numerous intersections with the underground void were created. There was continous seepage along the length of the surface mine as well as three major discharge points. These discharges, No.'s 5608, 5609, and 5610, contributed a combined acid load of 1,088 lb/day. On the opposite bank of the tributary a 180 gpm effluent was located. The discharge emerged via pipe from the base of the hill and carried an acid load of 2,808 lb/day. There were no obvious indications of mining on this side of Pine Run. However, the pipe may serve as a drainway to a mine on this side of the creek which was not located.

Mine No. 5894 was located on the Kiskiminetas River just above the confluence of Carnahan Run. The discharge emanates from a timered and partially open drift mouth about 20 vertical feet above Route 66. The 60 gpm discharge is piped under the highway and directly into the river. The acid load was 180 lb/day. What appears to be a second opening to this mine was located on the back side of the hill facing Carnahan Run. This opening was dry. There is a drive-in theatre at the site of this second opening and it appeared that much of the parking area was constructed of mine refuse.

Four additional drift mines were located on Carnahan Run and all were dry. This includes an active drift mine operated by the Kaskan Coal Company.

Guffy Run was the next downstream tributary affected by mine drainage. A series of seven drift openings were located, and all but one of these openings were dry. At Mine No. 5895, a discharge of 162 gpm was measured. The acid load carried by the effluent was 457 lbs/day.

Across from Guffy Run on the opposite bank of the Kiskiminetas River a small discharge from an old drift mine was located. This was Mine No. 5899 in the community of Hyde Park. The acid load was negligible.

Below the community of Leechburg, several mine openings were located at the site of the abandoned Maher Mine. All but one of the openings were dry. At Mine No. 5896 a 72 gpm effluent was located. The discharge point is above road level and the effluent cascades down the steep hillside and is piped under the highway to the river. The acid load was 239 lb/day.

Mine No.'s 5897 and 5898 were the last downstream sources of mine drainage discharge inventoried in the study area. Mine No. 5897 contributed an acid load of 122 lb/day and Mine No. 5898 contributed an acid load of 672 lb/day.

A total of 89 discharging sources and approximately 1,475 acres of strip mined area were investigated during this study. The total measured discharge was 4,439 gpm or nearly 6.4 mgd. Table 5 presents an area breakdown in terms of the total flow and total loading (lb/day) of polluting constituents discharged to receiving streams in the Kiskiminetas main stem and tributary areas. Table 6 presents a summary of flow volumes and chemical loadings by source type for the 89 discharging sources inventoried during the study.

## POLLUTION ABATEMENT

As shown in Table 6, refuse piles and inactive or abandoned drift mines are the principal pollution sources within the study area. There are also a few major pollution sources emanating from the other source types. It is readily apparent that pollution abatement activities in the main stem Kiskiminetas River would be of little or no value due to

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## TABLE 5

Mine drainage loadings by receiving streams
Kiskiminetas River, mainstem and minor tributaries

| Receiving Stream | No. of Sources | Total Discharges (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Wolford Run | 2 | 52 | 1,356 | 319 | 1,431 | 160 | 20 | 80 |
| Unnamed tribs to Wolford Run | 6 | 59 | 1,455 | 308 | 1,470 | 193 | 11 | 80 |
| Kiskiminetas River | 18 | 589 | 36,342 | 5,273 | 33,565 | 5,521 | 139 | 1,497 |
| Unnamed tribs to Kiskiminetas R. | 5 | 59 | 789 | 229 | 825 | 43 | 8 | 41 |
| Beaver Run | 2 | 120 | 3,167 | 515 | 3,846 | 611 | 15 | 117 |
| Unnamed tribs to Beaver Run | 7 | 50 | 467 | 317 | 549 | 30 | 10 | 14 |
| Unnamed tribs to Porter Run | 2 | 2 | 15 | 16 | 34 | 1 | 1 | 1 |
| Thorn Run | 1 | 4 | 119 | 26 | 117 | 18 | 0 | 5 |
| Unnamed tribs to Thorn Run | 6 | 28 | 830 | 293 | 741 | 80 | 7 | 46 |
| Unnamed tribs to Long Run | 3 | 405 | 3,389 | 3,433 | 7,163 | 136 | 40 | 54 |
| Pine Run | 4 | 329 | 3,896 | 1,553 | 9,056 | 1,215 | 42 | 50 |
| Rattling Run | 1 | 34 | 259 | 500 | 532 | 20 | 5 | 5 |
| Sulphur Run | 4 | 36 | 503 | 139 | 545 | 36 | 6 | 22 |
| Sugar Hollow | 1 | 5 | 80 | 19 | 68 | 8 | 1 | 4 |
| Roaring Run | 1 | 1 | 5 | 4 | 8 | 1 | 0 | 0 |
| Guffy Run | 1 | 162 | 457 | 286 | 2,040 | 68 | 4 | 16 |
| Blacklegs Creek | 2 | 10 | 56 | 52 | 92 | 1 | 1 | 5 |
| Unnamed tribs to Blacklegs Creek | 4 | 1,020 | -3,188 | 3,760 | 7,756 | 243 | 10 | 181 |
| Big Run | 3 | 1,059 | 5,643 | 6,889 | 8,536 | 370 | 55 | 583 |
| Unnamed tribs to Big Run | 2 | 311 | 1,640 | 1,098 | 2,783 | 35 | 14 | 147 |
| Whiskey Run | 3 | 3 | 9 | 13 | 19 | 0 | 0 | 1 |
| Unnamed tribs to Whiskey Run | 11 | 101 | 591 | 483 | 824 | 12 | 7 | 30 |
| TOTALS | 89 | 4,439 | 57,880 | 25,525 | 82,000 | 8,802 | 396 | 2,979 |

## TABLE 6.

Mine drainage loadings by source type
Kiskiminetas River mainstem and minor tributaries

| Source Type | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminu (lb/day |
|---|---|---|---|---|---|---|---|---|
| Strip Mines (abandoned) | 14 | 88 | 1,354 | 546 | 1,645 | 75 | 33 | 85 |
| Combination Mines* (abandoned) | 26 | 433 | 6,696 | 2,467 | 8,940 | 1,181 | 56 | 263 |
| Drift Mines (abandoned) | 37 | 2,410 | 27,127 | 13,446 | 39,250 | 4,197 | 212 | 1,532 |
| Refuse Piles | 8 | 92 | 22,601 | 2,041 | 17,411 | 2,978 | 54 | 875 |
| Drift Mines (active) | 2 | 401 | 3,365 | 3,402 | 7,112 | 135 | 39 | 53 |
| Shaft Mines (abandoned) | 1 | 1,008 | -3,330 | 3,605 | 7,560 | 232 | 2 | 168 |
| Oil Well (inactive) | 1 | 7 | 67 | 18 | 81 | 4 | 0 | 3 |
| TOTALS | 89 | 4,439 | 57,880 | 25,525 | 82,000 | 8,802 | 396 | 2,979 |

*Combination Mines = Surface and underground mines located within the same mined area.

the massive amounts of mine drainage which are received upstream by Loyalhanna Creek and the Conemaugh River. Complete elimination of all mine drainage problems in this study area would likely result in an insignificant water quality improvement in the main stem Kiskiminetas River. For this reason pollution abatement activities are justified only at such a time when consideration can be given to a total river basin abatement program which has achieved drainage control on a downstream priority basis. However, abatement of a single source or mine complex within the study area may also have merit as a demonstration site for the feasibility study of a particular mine drainage abatement problem.

Based on the initial field survey sampling program it was shown that 17 of the 89 discharging sites contributed about 81 percent of the total acid load measured in the study area. The combined acid load of these sources was in excess of 23 tons per day. Assuming previous or concurrent abatement of upstream sites, drainage control at these 17 principal sites should result in an improvement of the water quality in the main stem Kiskiminetas River. Perhaps the most significant reduction in acid load from any source type could be attained through drainage control at the large mine refuse area near Brownstown. The total acid load discharging from areas around the waste dump was nearly 11 tons per day.

The 17 principal sources mentioned above can provide a relative indication of where the major pollution problems occur in the study area. In the Kiskiminetas River mainstem and minor tributary area, all sites which contributed an acid load in excess of 600 lb/day are considered as principal sources.

Detailed engineering studies conducted during an entire water year may necessitate the consideration of additional sources or perhaps deletion of some sources initially considered. Until such a time these 17 sources can effectively serve as a first phase of priority in a program of drainage source abatement.

The following is a more detailed description of the 17 principal sources mentioned above. A listing of these sources is shown in Table 7. The locations of these sources are shown in Figure 5. None of the mines listed as principal sources were active; however, there were four drainage sources from the large mine waste dump at Brownstown which was associated with an active drift mine. At the time of the mine inventory an acid load exceeding 3,300 lb/day was discharged from the active David Mine of Canterbury Coal Company. Due to the installation of treatment facilities and the plans to further upgrade their facilities, this mine is not considered as a major pollution source in the study area.

## PRINCIPAL SOURCES

### Mine No. 604

This mine is located adjacent to the gravel road which runs along Big Run. Facing upstream the discharge point is located on the left side below the road bed almost at stream level. A slight hillside depression along the left side of the road may indicate the possible presence of the old drift opening. A negligible amount of mine water seepage was present at the base of the depression. The measured effluent was 324 gpm which carried an acid load of 1,750 lb/day.

## Mine No. 605

The 675 gpm discharge from Mine No. 605 flows from what remains of an old drift opening or from a drainway for a mine located elsewhere in the general area. The discharge has eroded a deep gully in the surrounding hillside. A network of culverts which once contained the mine effluent have been completely destroyed. Numerous subsidence areas were also noted along the hillside directly behind the discharge point. There were no refuse areas, mine buildings, loading facilities, or any other features generally associated with a mine site remaining at this location. The acid load discharged to Big Run was 3,443 lb/day.

## Mine No. 646

This mine site is located in the headwaters area of Blacklegs Creek on an unnamed tributary. A borehole discharge at this point contributed an alkaline effluent of 1,008 gpm to the receiving tributary. Although alkaline in nature (276 mg/l), this effluent is grossly discolored and, as a result, several miles of downstream Blacklegs Creek are similarly discolored. The alkaline load was 3,330 lb/day. There are very limited indications of mining activity in this area of the Blacklets Creek watershed. As a result, this borehole may drain abandoned workings located outside the watershed boundary, possibly from the

## TABLE 7

Principal mine drainage sources

Kiskiminetas River, main stem and minor tributaries

| Mine No. | Type of Mine | Flow (gpm) | pH | Specific Conductance micromhos/cm | Acidity mg/1 | Acidity lb/day | Receiving Stream |
|---|---|---|---|---|---|---|---|
| 604 | Drift Mine | 324 | 3.1 | 1,800 | 450 | 1,750 | Big Run |
| 605 | Drift Mine | 675 | 3.2 | 1,600 | 425 | 3,443 | Big Run |
| 646 | Shaft Mine (borehole) | 1008 | 7.0 | 2,000 | -267 | -3,330** | Unnamed tributary to Blacklegs Creek |
| 5207 | Drift Mine | 310 | 3.2 | 1,600 | 435 | 1,618 | Unnamed tributary to Big Run |
| 5534 | Strip Mine | 36 | 2.3 | 3,500 | 1,762 | 761 | Wolford Run |
| 5535 | Combination Mine* | 16 | 2.6 | 5,000 | 3,100 | 595 | Wolford Run |
| 5536 | Combination Mine | 30 | 2.4 | 3,500 | 1,940 | 698 | Unnamed tributary to Wolford Run |
| 5548 | Combination Mine | 110 | 3.1 | 3,900 | 2,200 | 2,904 | Beaver Run |
| 5608 | Combination Mine | 125 | 3.4 | 3,250 | 605 | 909 | Pine Run |
| 5611 | Drift Mine | 180 | --- | 5,000 | 1,300 | 2,808 | Pine Run |
| 5883 | Drift Mine | 80 | 2.8 | 8,000 | 5,700 | 5,472 | Kiskiminetas River |
| 5888 | Refuse Pile | 6 | 2.2 | 10,000 | 24,400 | 1,757 | Kiskiminetas River |
| 5889 | Drift Mine | 195 | 2.9 | 6,000 | 2,750 | 6,432 | Kiskiminetas River |
| 5890 | Refuse Pile | 2 | 3.1 | 13,600 | 34,000 | 8,232 | Kiskiminetas River |
| 5891 | Refuse Pile | 10 | 2.6 | 5,600 | 6,100 | 732 | Kiskiminetas River |
| 5892 | Refuse Pile | 60 | 2.7 | 12,400 | 15,500 | 11,160 | Kiskiminetas River |
| 5898 | Drift Mine | 10 | 5.4 | 8,000 | 5,600 | 672 | Kiskiminetas River |
|  | TOTALS | 3,177 |  |  |  | 46,613 |  |

*Combination mine = Surface and underground mine located within the same mined area

**Denotes alkalinity

McIntyre area.

During the reinvestigation of Blacklegs Creek (1971) this effluent was again sampled; however, no flow measurement was obtained. At the second sampling, the effluent from Mine No. 646 exhibited a net alkalinity of 157 mg/l (acidity 68 mg/l).

## Mine No. 5207

Mine No. 5207 was not located during the initial survey in 1966. It was found and sampled for the first time in 1971. It was not determined if this site represents a mine opening or a breakout point from an underground mine located elsewhere in the general area. The 310 gpm effluent carried an acid load of 1,618 lb/day. This effluent imparts noticeable discoloration to Big Run in the area upstream of Mine No. 604.

## Mine No. 5534

This mine was located near the headwaters of Wolford Run. The 36 gpm effluent represents cumulative seepage collected several hundred yards below a strip mined area. There were several drift openings in the strip mine highwall but they were dry. The acid load carried by the discharge was 761 lb/day.

## Mine No. 5535

The source of this 16 gpm discharge was a drift mine which has been intersected by a surface mine. There were at least three or four additional openings within this small disturbed area, but they were dry.

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This discharge was located in Wolford Run. The acid load was 595 lb/day.

Mine No. 5536

At this mine site a 30 gpm effluent was collected below an area which has been mined by both surface and underground methods. The strip mine area is several hundred yards in length and at least three drift openings were located in the highwall. The drift openings were dry; however, there was considerable seepage about the base of the spoil piles. The cumulative seepage from this area is collected in a pond which then discharges to an unnamed tributary of Wolford Run. The acid load was 698 lb/day.

Mine No. 5548

This mine is located immediately below the Beaver Run Reservoir. The 110 gpm discharge emanates from the base of a strip mine highwall at a point about 50 yards from a drift mine opening. The acid load carried by the effluent was 2,904 lb/day. A second effluent was located on the opposite side of the same drift opening. The acid load of this 10 gpm discharge (Mine No. 5547) was 263 lb/day.

Mine No. 5608

This mine was located near the mouth of Pine Run. A strip mine extends several hundred yards along one bank of the tributary. It appears that this operation has completely destroyed or covered the portal to an underground mine operation. In addition, numerous intersections with the underground mine void were created. Continuous seepage was observed along the length of the strip mine as well as three major discharge points. Mine No. 5608 represents the major discharge point. The acid load was 909 lb/day. The other two discharges contributed an additional acid load of 179 lb/day.

### Mine No. 5611

The discharge point of this mine was also located on Pine Run. However, it was on the opposite bank of the tributary from the discharges described above. The 180 gpm effluent emerged via pipe from the base of the hillside and carried an acid load of 2,808 lb/day. There were no obvious indications of mining on this bank of Pine Run. However, the pipe may serve as a drainway to a mine located elsewhere.

### Mine No. 5883

This abandoned drift mine was located within the Brownstown area mining complex along the bank of the Kiskiminetas River. Mine No. 5883 was one of the numerous openings in this immediate area. An 80 gpm effluent was measured at the partially open drift mouth. The acid load was 5,472 lb/day.

### Site No.'s 5888, 5890, 5891, and 5892

The discharges from these four sites are not directly attributable to a mine site location but rather they result from the large mine refuse dump associated with the Brownstown mining complex. The hilltop refuse site covers a number of acres and at the time of survey was in use by the Leechburg Mining Company. The combined acid load from the four measureable discharge points was 21,881 lb/day. The discharge from No. 5890 had an acidity concentration of 34,000 mg/l. Many trees and considerable vegetation has been destroyed along the downslope side of the refuse dump. This has resulted from many seepage areas along the edge of the pile. It is areas such as these which prohibit the accurate determination of the total pollutional load which this area contributed to the Kiskiminetas River.

### Mine No. 5889

This is another abandoned and caved mine opening in the Brownstown area complex. This old opening may have been a fanway or drainway to one of the numerous mines in the immediate area. The discharge was located about 60 vertical feet above the river. From the point of discharge the effluent spreads over a wide area destroying all vegetation before it finally enters the river. The acid load was 6,432 lb/day.

### Mine No. 5898

This mine is located along the bank of the Kiskiminetas River about 0.7 miles above the mouth of the river. At least two caved openings to the mine were located. The 10 gpm discharge is about 60 vertical feet above the river. In addition to the major discharge point there are also several seepage areas around the vicinity of the old openings. The acid load was 672 lb/day.

# LOYALHANNA CREEK
# MINE DRAINAGE INVENTORY

## LOYALHANNA CREEK

## SUMMARY AND CONCLUSIONS

1. Loyalhanna Creek drains an area of 300 square miles in Westmoreland County, Pennsylvania. Coal mine operations were absent in several areas of the watershed, particularly in the headwaters area.

2. Main stem Loyalhanna Creek and several tributaries to Loyalhanna Creek are seriously polluted by coal mine drainage. The effects upon stream water quality are most apparent below the community of Latrobe.

3. A total of 52 discharging sources and approximately 900 acres of surface mined area were investigated in the Loyalhanna Creek watershed. Discharges from the coal mine sources ranged from one to 5,097 gpm and totalled 16.1 million gallons per day (mgd). The total net acid load discharged by the 52 sources was 65,407 lb/day.

4. At the time of survey, active operations were limited to one surface and one small underground mine. There was no discharge from either mine. Abandoned underground mines were the major source of pollution in the watershed, contributing over 90 percent of the total net acid load.

5. A total of 15 principal sources of mine drainage discharge were located in the study area. These sources discharged a total acid load of 62,407 lb/day, about 96 percent of the acid load discharged by all 52 sources inventoried during the survey. In turn, three of the principal sources, No.'s 5177, 5356, and 5364 discharged a combined acid load of nearly 25 tons per day.

## DESCRIPTION OF AREA

The headwaters of Loyalhanna Creek arise near the community of Stahlstown. From this point, the stream flows generally north toward Ligonier. Laughlintown Run and Linn Run are two major headwater tributaries of Loyalhanna Creek. Both of these tributaries drain the mountainous areas of Laurel Hill.

Mill Creek is another major tributary which joins Loyalhanna Creek at Ligonier. From this point, Loyalhanna Creek flows northwest to the community of Latrobe and from there to its confluence with the Conemaugh River at Saltsburg. The confluence of Loyalhanna Creek and the Conemaugh River forms the Kiskiminetas River. Loyalhanna Creek drains an area of 300 square miles and the Conemaugh River drains an area of 1,376 square miles.

## STREAM WATER QUALITY

At the time of the study, Loyalhanna Creek was unaffected by mine drainage above the confluence of Mill Creek in the community of Ligonier. There were no coal mine operations inventoried on any of the headwater tributaries above Ligonier.

The first area of coal mining activity in the watershed occurred on Mill Creek. Although there were numerous discharging mine sites located on tributaries to Mill Creek, the effects upon the water quality of main stem Mill Creek were moderate. There were no major sources of mine drainage pollution located in the area of the watershed between Ligonier and the downstream community of Latrobe.

In the community of Latrobe, Loyalhanna Creek received two massive discharges from abandoned mines. In combination, these two effluents completely deplete the in-stream alkalinity and Loyalhanna Creek remains grossly polluted over its entire remaining downstream length. A third such discharge was located on Crabtree Creek which drains to the headwaters of Loyalhanna Reservoir.

During the course of the field study (1968) several stream locations were sampled for chemical analysis (Table 8). These stations were selected to measure the cumulative effects of mine drainage. A summary of this stream data is presented in Table 9. The locations of these sampling points are shown in Figure 6.

With the exception of Station No. 5622, all stream sampling points are located below (downstream) major mine drainage inflow. Station No. 5622, USGS gage at Kingston, was located above (upstream) all major sources of mine drainage. As shown in Table 9, the acidity concentration exceeded the alkalinity concentration on two of the three sampling dates. However, the pH of the stream at this point remained above 8.0. Mine drainage discharges totalling about 1500 lb/day were discharged to watershed streams above Kingston. As mentioned, most of this acid load was discharged to Mill Creek. Although this tributary adds acidity to Loyalhanna Creek, the stream is apparently well buffered and assimilates the acidity without lowering the pH of the stream.

## TABLE 8

### Stream water quality sampling stations
### Loyalhanna Creek

| Station No. | Sampling Period | Stream | Location |
|---|---|---|---|
| 5622 | Oct, Noc, Dec, 1968 | Loyalhanna Creek | USGS gage @ Kingston |
| 5623 | Oct, Noc, Dec, 1968 | Monastery Run | Near mouth |
| 5624 | Oct, Nov, Dec, 1968 | Saxmans Run | Near mouth |
| 5630 | Nov, Dec, 1968 | Crabtree Creek | Near mouth |
| 5292 | July, Oct, Nov, 1968 | Loyalhanna Creek | USGS gage below reservoir |
| 5616 | Oct, Nov, Dec, 1968 | Getty Run | Near mouth |

During the earlier 1966 stream survey, an additional stream sampling point (No. 572) was located on Loyalhanna Creek above Ligonier. This station was located above all mine drainage inflow. On each of the six samplings at this station, Loyalhanna Creek carried a net alkalinity. However, acidity was present on each sampling occasion. The acidity concentration ranged from 5 mg/l to 11 mg/l while the alkalinity concentration ranged from 12 mg/l to 39 mg/l (Appendix A). This background water quality sampling location indicates that, although the stream was consistently alkaline, an appreciable amount of natural acidity was carried by Loyalhanna Creek in the headwaters of the watershed. This natural in-stream acidity, in combination with the acid load discharged to Loyalhanna Creek by Mill Creek may, in part, account for the conditions found at the Kingston sampling point.

Miller Run is a small tributary which enters Loyalhanna Creek at Kingston. The mouth of Miller Run is approximately 125 feet upstream of the gage house on the same bank of the Creek. Several dry mines and one discharging mine were located on Miller Run. The sampling point location at Kingston was inadvertently located at the USGS gage. The flow reading was obtained from the gage house and the sample collected along the bank of the stream. Ideally, the sample point should have been above the mouth of Miller Run. The samples, as collected only a little more than 100 feet below the mouth of Miller Run, may not have accurately represented the water quality of Loyalhanna Creek at this point.

## Table 9

Stream water quality data
Loyalhanna Creek

| Station No. | Sampling Date | Flow (gpm) | pH | Specific 1/ Conductance | Total Acidity mg/l | Total Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9628 | 10/31/68 | 4,320 | 8.2 | 400 | 15 | 778 | 75 | 3,888 | 80 | 4,147 | 0.6 | 31 | 0.1 | 5 | 0.8 | 21 |
| " | 11/13/68 | 37,800 | 8.0 | 280 | -8 | -3,628 2/ | 72 | 32,659 | 30 | 13,608 | 0.6 | 272 | 0 | 0 | 1.5 | 68 |
| " | 12/ 3/68 | 75,600 | 8.3 | 220 | 24 | 21,773 | 54 | 48,989 | 35 | 31,752 | 0.8 | 725 | 0.3 | 272 | 1.6 | 1,452 |
| 9623 | 10/31/68 | 371 | 7.2 | 1275 | 97 | 432 | 230 | 1,023 | 435 | 1,936 | 14.6 | 65 | 4.0 | 18 | 0.8 | 4 |
| " | 11/19/68 | 4,126 | 7.5 | 625 | -36 | -1,782 | 171 | 8,466 | ---- | ------- | [illegible] | 178 | 1.0 | 50 | 2.1 | 104 |
| " | 12/3/ 68 | 2,368 | 7.2 | 650 | -33 | 938 | 146 | 4,148 | 170 | 4,831 | [illegible] | 151 | 1.7 | 48 | 1.4 | 40 |
| 9624 | 10/24/68 | 1,110 | 4.5 | 1400 | 340 | 4,529 | 416 | 5,541 | 765 | 10,190 | 87.9 | 1,171 | 7.5 | 100 | 15.7 | 209 |
| " | 11/18/68 | 2,385 | 5.6 | 925 | 229 | 6,554 | 240 | 6,869 | ---- | ------- | 40.0 | 1,145 | 3.2 | 92 | 8.4 | 240 |
| " | 12/ 3/68 | 1,680 | 5.4 | 950 | 315 | 6,350 | 240 | 4,838 | 590 | 11,894 | 56.0 | 1,129 | 4.2 | 85 | 10.0 | 202 |
| 9630 | 11/15/68 | 5,137 | 4.6 | 1500 | 230 | 14,178 | 476 | 29,343 | 880 | 54,247 | 85.8 | 5,289 | 3.0 | 185 | --- | ------ |
| " | 11/19/68 | 9,270 | 6.9 | 950 | 121 | 13,450 | 320 | 35,597 | ---- | ------- | 47.8 | 5,317 | 1.8 | 200 | 4.8 | 534 |
| " | 12/ 3/68 | 6,184 | 5.8 | 950 | 250 | 18,522 | 355 | 26,344 | 100 | 7,421 | 70.0 | 5,195 | 0.2 | 15 | 4.1 | 304 |
| [illegible] | 7/11/68 | 409,500 | 3.2 | 2100 | 170 | 835,380 | 400 | 1,965,600 | 475 | 2,334,150 | 5.0 | 24,570 | 5.2 | 25,553 | 4.7 | 23,096 |
| " | 10/30/68 | 7,200 | 3.3 | 1350 | 270 | 23,328 | 340 | 29,376 | 720 | 62,208 | 6.5 | 562 | 4.6 | 397 | 3.1 | 268 |
| " | 11/13/68 | 72,000 | 3.1 | 1200 | 164 | 141,696 | 304 | 262,656 | 435 | 375,840 | 9.2 | 7,949 | 3.7 | 3,197 | 3.1 | 2,678 |
| 9616 | 10/30/68 | 710 | 3.1 | 2200 | 1540 | 13,121 | 408 | 3,476 | 1170 | 9,968 | 92.4 | 787 | 10.1 | 86 | 76.9 | 655 |
| " | 11/20/68 | 1,964 | 3.5 | 1100 | 400 | 9,427 | 191 | 4,501 | ---- | ------- | 40.9 | 964 | 3.9 | 92 | 23.2 | [illegible] |
| " | 12/ 4/68 | 9,154 | 4.8 | 650 | 205 | 22,518 | 129 | 14,170 | 300 | 32,954 | 17.4 | 1,911 | 2.2 | 242 | 11.7 | 1,285 |

1/ Specific conductance measured as micromhos/cm

2/ Negative value denotes alkalinity

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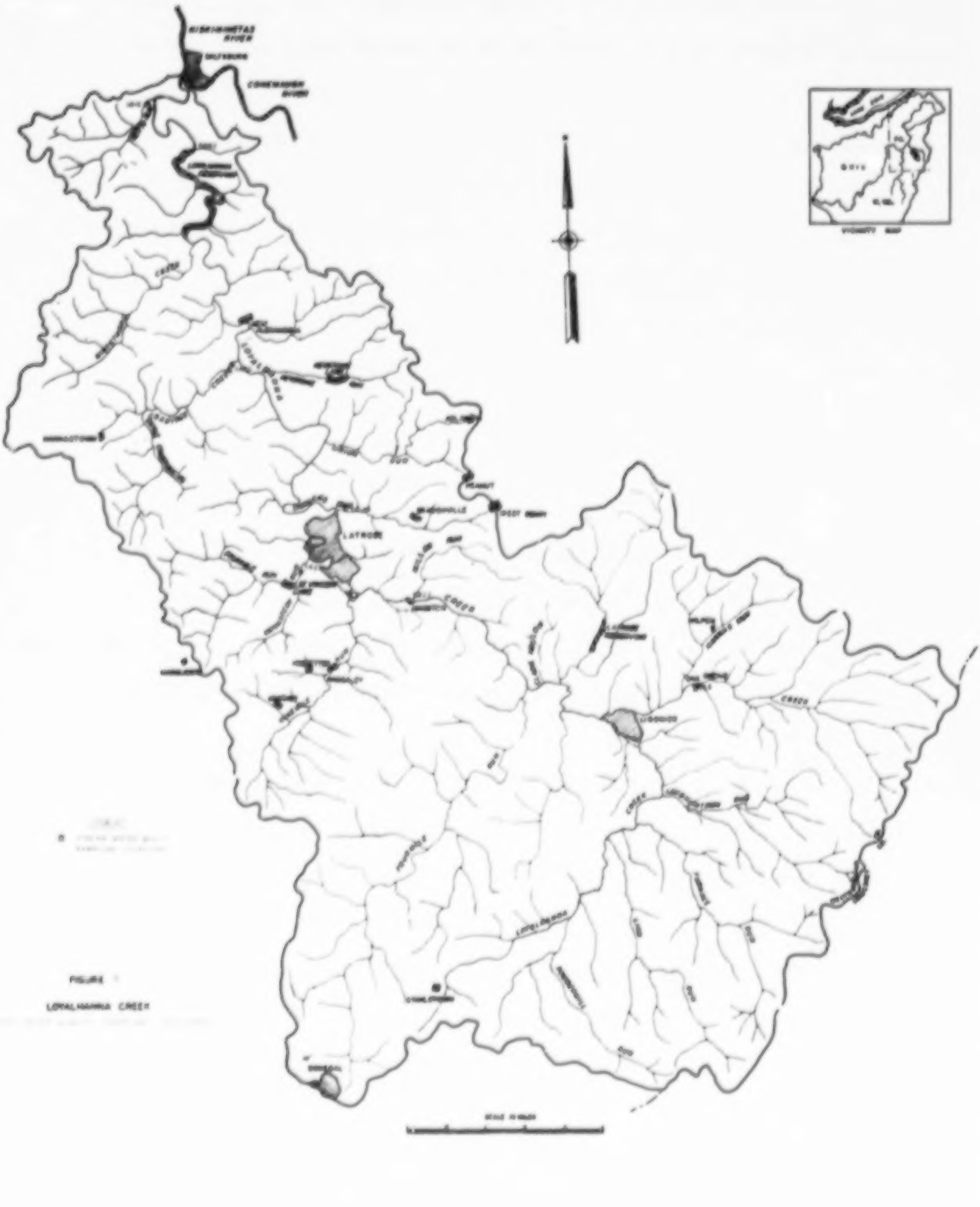
KISKIMINETAS RIVER
SALTSBURG
CONEMAUGH RIVER
LATROBE
LIGONIER
CREEK
LOYALHANNA
VICINITY MAP
OHIO
W.VA.

LEGEND

● STREAM WATER QUALITY SAMPLING STATIONS

FIGURE [illegible]

LOYALHANNA CREEK

[illegible]

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## SOURCES OF MINE DRAINAGE

Approximately 165 mining sites and an estimated 900 acres of surface mined area were investigated in this study. Samples for chemical analysis were collected from 52 sources discharging at the time of the survey. The total effluent volume was 11,165 gpm or 16.1 million gallons per day (mgd). The total net acid load discharged to Loyalhanna Creek and its tributaries was 65,407 lb/day.

A description of the mine drainage source follows. All mine site locations inventoried in the Loyalhanna Creek watershed are shown in Figure 7.

### Mill Creek

The first upstream area of coal mine operations in the Loyalhanna Creek watershed were located on Hannas Run, a tributary to Mill Creek. Mill Creek drains an area of 21 square miles. However, the mine operations were limited to the portion of the drainage area around the community of Wilpen.

A number of surface and underground mines were located on Hannas Run. Several of the old underground mine operations were associated with the production of coke. Banks of abandoned and deteriorating bee-hive coke ovens remain at several of the old underground mine sites. Most of the surface mines were quite limited in size and were restricted to hill top locations.

Mine No.'s 5266 and 5267 were located on an unnamed tributary to Hannas Run west of Wilpen. Both were small underground mines and probably quite limited in the extent of development. The combined acid load from these mines was 156 lb/day. Northeast of these two mines a series of six drift mines were located on another unnamed tributary to Hannas Run. The total net acid load discharged by these mines was 424 lb/day (Mine No.'s 5269, 5270, 5271, 5274, and 5275). Several underground mine openings appear to have been destroyed or covered by a surface mine at Wilpen. At least two underground openings were located within the disturbed area. A 180 gpm effluent was measured at Mine No. 5265. The second mine opening was dry.

The last sources of mine drainage to enter Mill Creek were located on an unnamed tributary west of Oak Grove. A total acid load of 748 lb/day was discharged to this tributary from three sources. Mine No. 5264 was an old drift opening discharging at the rate of 40 gpm. The acid load was 259 lb/day. There are several surface mines located near the headwaters of this tributary. There were no discharges draining directly to the tributary; however, these mines were affecting the water quality of this small stream. Below the disturbed area an acid load of 428 lb/day was carried by the tributary.

## Loyalhanna Creek, Ligonier to Latrobe

Clark Hollow was the first downstream area affected by mine drainage in this portion of the watershed. A total of nine drift mine openings were located along Clark Hollow. At the time of the survey a small one-man drift mine was active in this area. The mine was dry. Several hundred yards below this operation a 30 gpm effluent from one of the old drift openings was located. This discharge carried an acid load of 108 lb/day.

Two slumped drift mine openings were located south of Route 30 and adjacent (west side) to Idlewild Amusement Park. What appears to be a mine seal was located at the base of one of these slumped openings. A 12 gpm effluent was measured at the seal. The drainage formed a small impoundment and then overflowed to Loyalhanna Creek. The acid load from this mine (No. 5072) was 127 lb/day.

Miller Run enters Loyalhanna Creek just upstream of the USGS gaging station at Kingston. A total of ten mine openings were located within this 3.6 square mile drainage area. Mine No. 5073 contributed an acid load of 27 lb/day. All other mine sites were dry.

## Ninemile Run

Ninemile Run drains an area of 21 square miles south of Latrobe. The tributary enters Loyalhanna Creek just north of the intersection of Routes 30 and 982.

Abandoned underground mine operations were located near the communities of Whitney, Hostetter, and Baggaley. The location of the mine openings have been destroyed or filled. The only source of mine drainage located in this area was on a small unnamed tributary which joins Ninemile Run at Baggaley. The source of the drainage was a large refuse pile adjacent to the stream. Seepage from this pile had grossly degraded the water quality of the tributary. The acid load carried by the stream below the refuse area was 1,928 lb/day (No. 5351).

There were no additional drainage sources located on Ninemile Run during the survey.

## Monastery Run - Fourmile Run

There were no discharging sites located on Monastery Run. However, what appeared to be an old entry to the St. Vincent mine was located along the bank of Monastery Run. The only evidence which remains at the site is a mine refuse pile.

Fourmile Run, a tributary to Monastery Run, was seriously polluted as a result of mine discharges. One drift mine and several surface mines were located near the headwaters of the stream; however, these mines were dry. In the downstream area, above St. Vincent Lake, a series of mine drainage sources were located adjacent to the tributary. A 22 gpm effluent was located near an old bridge crossing above the lake. The effluent (No. 5359) was discharged to the tributary by a 6 inch pipe. The acid load was 247 lb/day. Above this point, a swampy area existed along both banks of Fourmile Run. Within this area, three additional mine discharges were located. These discharges were artesian in character and contributed considerable mine drainage acidity to the tributary. The total acid load from these sources (No.'s 5260, 5261 and 5262) was 1,842 lb/day. The iron load from these sources was 740 lb/day. Similar sites were located adjacent to the tributary; however, these sites were situated almost at stream level and therefore not readily measurable.

## Loyalhanna Creek - Latrobe Area

One of the three largest sources of mine drainage discharge in the Loyalhanna Creek watershed was located along the bank of the main stem just below the confluence of Monastery Run. A horizontal pipe, several feet above stream level, discharged an effluent of 1,990 gpm to Loyalhanna Creek. This was discharge No. 5364. Due to the velocity of the discharge and the somewhat limited capacity of the pipe, an estimated 50-100 gpm of additional drainage was forced through the strata surrounding the pipe.

A second effluent was located a few feet downstream of No. 5364. The second effluent discharged from a vertical pipe emerging from the stream bed in the middle of Loyalhanna Creek. The discharge from this pipe was 62 gpm (No. 5363).

The discharges from No.'s 5363 and 5364 were somewhat peculiar in that, upon emergence from underground, the effluents were quite clear and exhibited a pH of 7.4. Downstream of the discharge point, Loyalhanna Creek became grossly discolored and the pH of the stream began to drop. This apparently resulted from downstream hydrolysis of the mine effluents. The result of this hydrolysis was the production of the in-stream acidity and the precipitation of iron compounds along the banks and on the stream bottom.

The effluents collected at the two points indicated that a total acid load of 17,860 lb/day was discharged to Loyalhanna Creek. The major part of this load, 17,432 lb/day, was from No. 5364. The iron load carried by this discharge was over 8,200 lb/day.

The discharges from No.'s 5363 and 5364 are believed to result from the St. Vincent Mine. A local resident reported that the horizontal pipe (No. 5364) was installed in an attempt to drain as much of the water from the old mine as possible. Before installation of this drainway, much of the surrounding area was reported as having been swampy and unstable similar to the situation found above St. Vincent Lake.

This drainway may also serve as a common discharge point for mines interconnected with the St. Vincent Mine. This could include the mines in the Baggaley, Hostetter, and Whitney areas. It may even include mines outside the Loyalhanna Creek drainage area such as the mine at Marguerite. This abandoned mine is located near the headwaters of Sewickley Creek which drains to the Monongahela River.

Several additional boreholes were located in the same general area as the discharges described above. A series of three boreholes were located about 0.4 mile upstream of discharge No. 5364. These boreholes were located beside a small oxbow lake adjacent to Loyalhanna Creek. The holes were dry but a local resident reported that they do drain after periods of heavy rainfall.

## Saxman Run

The headwaters of this tributary rise near the small community of West Derry, and were immediately degraded by mine drainage. Three shaft mines and one drift mine were located in this area. A 70 gpm discharge was found at Mine No. 5074. A portion of this drainage emerges from a pipe at the shaft site and the remaining part of the discharge emerges from a structure similar to a spring house adjacent to an occupied house on the opposite side of the road. The acid load was 183 lb/day. Mine No. 5075 contributed an additional discharge of 15 gpm which carried an acid load of 35 lb/day. This was also a shaft mine and similar to the other two in the area, which had recently been filled.

Two additional shaft mines and one drift mine were located near the community of Bradenville; however, these mines were dry.

A 2,269 gpm discharge from Mine No. 5177 was located near the mouth of Saxman Run. The original mine opening has been destroyed by highway construction. During the construction, a culvert was placed under the road bed and the mine discharge drains under the highway via this culvert to Saxman Run. The acid load contributed by this discharge was 12,389 lb/day. This was the second of the three major discharges located in the Loyalhanna Creek watershed. As with the St. Vincent drainway, the discharge from this mine is reportedly supplied by a series of interconnected underground mines.

## Union Run

Large slope and shaft mines were located on the two headwater tributaries of Union Run near the communities of Peanut and Atlantic. The mines did not have discharges at these points; however, seepage was contributed to the streams from the refuse piles associated with the old mines. Further downstream, additional underground and several surface mines were located along Union Run. The total acid load from three discharging sites (Mine No.'s 5301, 5302, and 5303) was 229 lb/day. These three discharges in combination with the immeasurable seepage areas throughout the drainage area are sufficient to completely degrade the water quality of Union Run over its entire length. At its mouth, Union Run had a pH of 3.5 and a conductivity of 1,250.

It appears likely that the discharge point on Saxman Run (No. 5177) may also drain some of the larger mines in the Union Run drainage area.

Loyalhanna Creek, main stem and minor tributaries

Only minor amounts of mine drainage were discharged to Loyalhanna Creek below Union Run and the next major downstream tributary, Crabtree Creek.

One surface mine and one underground mine were the only sources located on the east bank of Loyalhanna Creek. Two slumped drift mine openings were located below the Keystone Lake dam. The combined acid load from these openings was 280 lb/day. The surface mine was dry.

Seven surface mines and four drift mine openings were located along the west bank of Loyalhanna Creek. Only two of these mine sites were discharging. An acid load of 3 lb/day was discharged by Mine No. 5358 and Mine No. 5357 contributed an acid load of 121 lb/day.

## Crabtree Creek

Crabtree Creek has been extensively mined in all portions of its 19 square mile drainage area. Several of the underground operations appear to have been quite extensive and were often associated with coke production.

The first major mine site in the Crabtree Creek drainage area was located in the community of Forbes Road. The mine was apparently a shaft or slope which has been filled or covered. The mine buildings are currently used by a small local industry. Mine refuse dumps are located along both banks of Crabtree Creek.

The next major downstream mine site on Crabtree Creek was located at Hannastown. This mine also had a slope or shaft opening which has been filled or covered. A very large refuse pile is located along the north bank of Crabtree Creek and contributed considerable seepage to the stream. Below this refuse pile, an acid load of 898 lb/day was carried by Crabtree Creek (Sta. No. 5355).

A series of surface and underground mines were located on Little Crabtree Creek. Mine No. 5354 was the only mine on this tributary which contributed drainage during the study. The acid load from this combination surface and underground mine was 100 lb/day.

The largest single source of mine drainage in the Loyalhanna Creek watershed was located about 0.5 mile below the confluence of Little Crabtree Creek and Crabtree Creek. This 5,097 gpm discharge was from the Crabtree Mine (Mine No. 5356). However, this discharge point also drains other mines in the surrounding area which are interconnected with the Crabtree Mine. The acid load discharged to Crabtree Creek by this single source was 19,572 lb/day.

Stream sampling conducted near the mouth of Crabtree Creek coincident with the mine drainage survey showed that this stream discharged an average acid load exceeding 15,000 lb/day to Loyalhanna Creek (Table 9).

## Loyalhanna Creek, New Alexandria Area

Approximately 20 surface mines and several abandoned underground mines were located in this general area. The only major underground site was the slope or shaft mine at Shieldsburg. There was no direct discharge from the mine; however, the large refuse pile contributed considerable seepage to the unnamed tributary which drains this area. The remaining mines in the area were either dry or contributed only insignificant amounts of mine drainage acidity to the tributaries draining the area.

A total of seven underground mines and two surface mines were located along the banks of Loyalhanna Creek just below the Loyalhanna Reservoir dam. None of these mines contributed any mine drainage discharge.

## Getty Run

Getty Run was the last downstream tributary affected by mine drainage before the confluence of Loyalhanna Creek and the Conemaugh River at Saltsburg. The stream is totally degraded over its entire length as a result of mine drainage. A total of 12 discharges with a combined acid load of 8,091 lb/day were inventoried on this tributary.

Mine No. 5170 discharged the major part of the total acid load. This mine was located near the headwaters of the tributary and discharged at the rate of 240 gpm. The acid load was 4,060 lb/day. A second significant acid load was discharged by Mine No. 5171. The opening was located about 30 feet above stream level and discharged 45 gpm. The opening may represent a drainway or airway for one of the numerous mines in this area. The acid load discharged by Mine No. 5171 was 940 lb/day. Mine No.'s 5173 and 5176 discharged acid loads of 936 lb/day and 417 lb/day, respectively, to small unnamed tributaries of Getty Run. These mine discharges were located in areas associated with both surface and underground mine operations. Mine No.'s 5163 and 5164 represent the last two major discharge points on Getty Run. These mines were located on an unnamed tributary to Getty Run. The mines were hillside drifts located directly across from each other on opposite banks of the small tributary. The acid loads from Mine No.'s 5163 and 5164 were 688 lb/day and 586 lb/day, respectively.

At the time of the source investigation, a rather large drift mine operation near the mouth of Getty Run had recently been closed. The tipple was being disassembled at the time. This mine did not contribute any direct discharge. However, severe leaching occurred at the base of the refuse pile associated with the mine. Seepage areas were common throughout all portions of the Getty Run drainage area. This was particularly evident below the surface mined areas.

Stream sampling near the mouth of Getty Run, coincident with the source inventory, indicated that this tributary discharged an average acid load of about 15,000 lb/day to Loyalhanna Creek (Table 9).

A total of 52 discharging sources and approximately 900 acres of surface mined area were investigated during this study. Table 10 presents an area breakdown in terms of total flow and total loading (lb/day) of polluting constituents discharged to receiving streams in the Loyalhanna Creek watershed. Table 11 presents a summary of flow volumes and chemical loading by source type for the 52 discharging sources inventoried during the study.

## POLLUTION ABATEMENT

As shown in Table 11 , shaft mines were the principal pollution sources in the study area. The total acid load discharged from shaft or slope mine sources was 51,881 lb/day. Drift mines were the secondary major source type and discharged an acid load of 9,084 lb/day. In addition, significant acid loads were discharged by one surface mine and two mine refuse areas.

Including all source types, a total of 15 principal sources of mine drainage discharge were located in the Loyalhanna Creek study area. These sources included six shaft or slope mines, six drift mines, two mine refuse dumps, and one surface mine. These sources discharged a total acid load of 62,470 lb/day, about 96 percent of the acid load discharged by all 52 sources located during the survey.

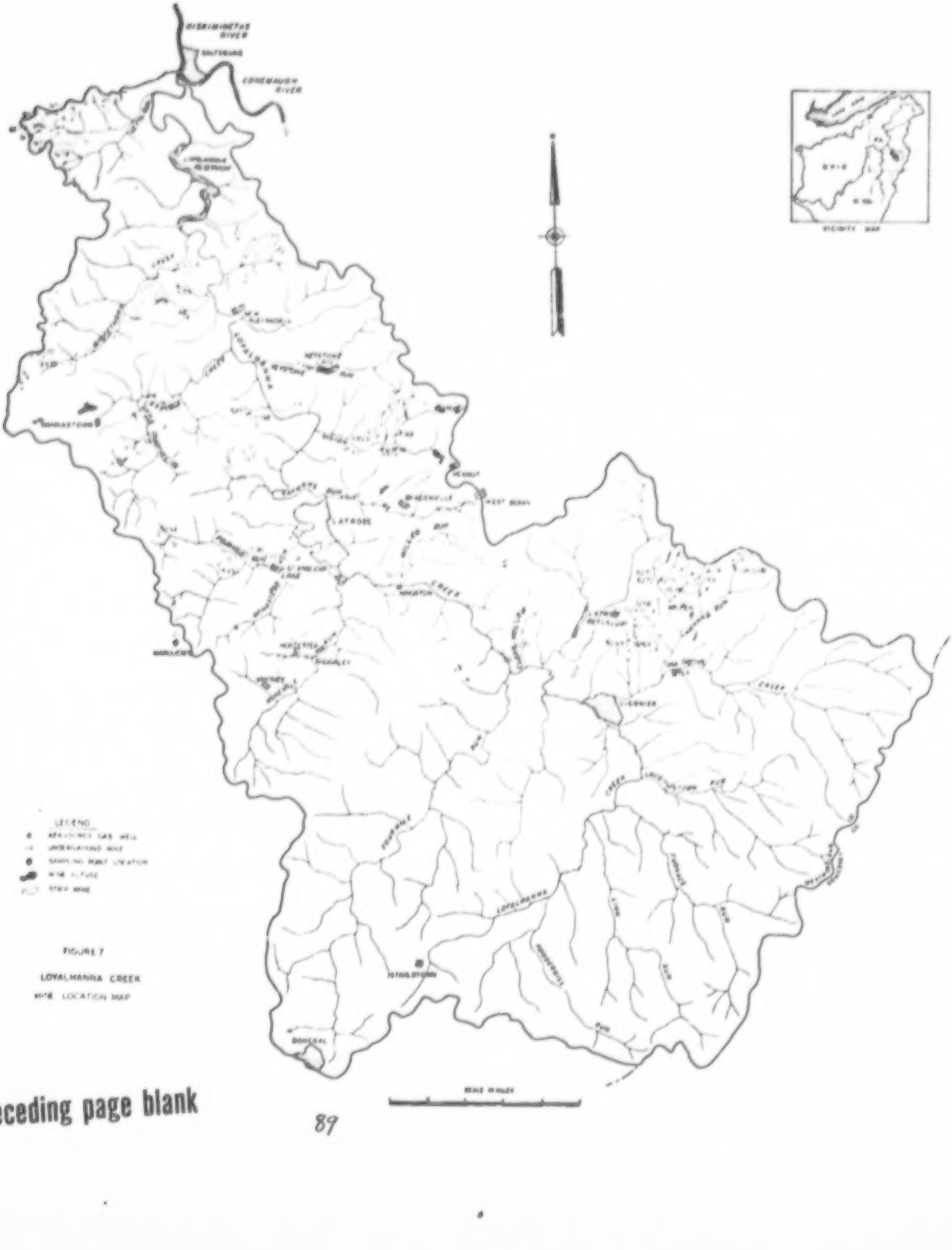
KISKIMINETAS RIVER
SALTSBURG
CONEMAUGH RIVER
LOYALHANNA CREEK
KEYSTONE
LATROBE
WEST DERRY
LIGONIER
STAHLSTOWN
DONEGAL
OHIO
VICINITY MAP
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE OUTFLOW
STRIP MINE

FIGURE 7

LOYALHANNA CREEK

MINE LOCATION MAP

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TABLE 10

Mine drainage loading by receiving stream
Loyalhanna Creek

| Receiving Stream | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Loyalhanna Creek | 3 | 2,064 | 17,987 | 26,849 | 47,975 | 8,458 | 688 | 58 |
| Unnamed tribs to Loyalhanna Creek | 4 | 34 | 236 | 103 | 303 | 30 | 2 | 13 |
| Getty Run | 4 | 296 | 5,172 | 1,567 | 6,367 | 698 | 54 | 260 |
| Unnamed tribs to Getty Run | 8 | 198 | 2,919 | 754 | 3,736 | 336 | 26 | 151 |
| Crabtree Creek | 2 | 5,177 | 20,470 | 53,702 | 70,903 | 12,075 | 327 | 314 |
| Little Crabtree Cr. | 1 | 10 | 100 | 24 | 79 | 8 | 2 | 3 |
| Keystone Run | 1 | 62 | 280 | 385 | ------ | 56 | 2 | 14 |
| Union Run | 1 | 31 | 229 | 105 | 348 | 23 | 4 | 10 |
| Saxman Run | 3 | 2,354 | 12,607 | 10,910 | 26,027 | 2,974 | 204 | 445 |
| Ninemile Run | 3 | 70 | 1,928 | 360 | 2,730 | 432 | 22 | 159 |
| Miller Run | 1 | 37 | 27 | 87 | 122 | 1 | 1 | 4 |
| Fourmile Run | 1 | 213 | 2,045 | 3,593 | 6,923 | 909 | 125 | 17 |
| Clark Hollow | 6 | 2 | 10 | 3 | 13 | 0 | 0 | 1 |
| Unnamed tribs to Miller Creek | 3 | 148 | 748 | 865 | 1,538 | 36 | 8 | 28 |
| Hannas Run | 1 | 180 | -13 1/ | 1,547 | 1,296 | 27 | 2 | 9 |
| Unnamed tribs to Hannas Run | 9 | 287 | 585 | 1,992 | 2,556 | 14 | 9 | 23 |
| Whitethorn Creek | 1 | 2 | 77 | 7 | 77 | 13 | 0 | 5 |
| TOTALS | 52 | 11,165 | 65,407 | 102,853 | 170,993 | 26,090 | 1,476 | 1,514 |

1/ negative value denotes alkalinity

## TABLE 11

Mine drainage loadings by source type
Loyalhanna Creek

| Source Type | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Combination Mines* | 10 | 338 | 618 | 2,575 | 2,950 | 99 | 9 | 39 |
| Drift Mines | 21 | 799 | 9,084 | 4,361 | 12,518 | 1,268 | 110 | 454 |
| Strip Mines | 7 | 221 | 938 | 1,079 | 2,012 | 62 | 15 | 43 |
| Refuse Piles | 4 | 156 | 2,851 | 740 | 3,947 | 519 | 31 | 238 |
| Shaft Mines | 9 | 9,648 | 51,881 | 94,078 | 149,528 | 24,138 | 1,311 | 738 |
| Coal Outcrop | 1 | 3 | 35 | 20 | 38 | 4 | 0 | 2 |
| TOTALS | 52 | 11,165 | 65,407 | 102,853 | 170,993 | 26,090 | 1,476 | 1,514 |

* Combination mine = Surface and underground mine located within the same mined area

In the Loyalhanna Creek watershed, all sites which contributed an acid load in excess of 400 lb/day are considered as principal sources.

A designed program of pollution abatement in the Loyalhanna Creek must give primary consideration to Mine No.'s 5177, 5356, and 5364. These three mines contributed the massive acid discharges on Saxman Run, Crabtree Creek, and main stem Loyalhanna Creek. Although the other source types listed above discharged significant acid loads, abatement of these sources without previous or concurrent abatement of the three largest discharges, would result in only an insignificant water quality improvement within the watershed. Mine No.'s 5177, 5356 and 5364 discharged a combined acid load of nearly 25 tons per day. The remaining 12 principal source sites discharged an acid load of 6.5 tons per day. By comparison, the acid load discharged by Mine No. 5177, the smallest of the three major sources (12,389 lb/day), closely approximated the combined acid load of the other 12 sites (13,077 lb/day).

It is necessary to consider the other 12 sources sites in a complete program of drainage abatement. Failure to consider these sources would result in the discharge of significant acid loads to watershed streams even after abatement of the three major source sites. This is of particular importance on Getty Run. Without abatement of the principal sources on this small tributary, significant amounts of acid drainage would be discharged to Loyalhanna

Creek. During the mine drainage survey, Getty Run (Sta. No. 5616) discharged an average acid load of about 15,000 lb/day to Loyalhanna Creek.

The abatement of mine drainage is often a difficult task, irrespective of the source type responsible for the discharge. In addition to the problems associated with the sealing of underground drift mines and the reclamation of surface mines and gob pile areas, a mine drainage remedial program in this watershed is faced with the difficult problem of abating large volumes of mine drainage emanating from interconnected shaft or slope mine complexes. This particular problem is represented by the discharges associated with Mine No.'s 5177, 5363 and 5364.

It is beyond the scope of this initial mine drainage survey to accurately assess the magnitude of the abatement problem which these mines represent. However, based on the initial study, it is apparent that until such a time when drainage control can be successfully achieved at these sites, abatement at the other 12 source sites would be of only minimal value.

Since completion of the 1968 survey, the Commonwealth of Pennsylvania has initiated additional engineering studies in the Loyalhanna Creek watershed. This study is designed to recommend specific abatement measures for the mine sources in the watershed. The laboratory data and mine site location maps developed during the 1968 study and presented in this document provided the preliminary basis for the secondary study. It is anticipated that this study will provide a detailed plan of abatement for mines in the Loyalhanna Creek watershed.

Detailed engineering studies and long term repetitive water quality sampling of the discharge sites may necessitate the consideration of additional sources or perhaps the deletion of some sources initially considered. However, the further development of correlation between mine discharge characteristics and stream water quality will not alter the primary abatement considerations warranted by Mine No.'s 5177, 5363 and 5364.

The following is a more detailed description of the 15 principal sources recommended for abatement. These sources can effectively serve as a first phase or priority in a program of drainage source abatement in the Loyalhanna Creek watershed. These sources are listed in Table 12 and the mine site locations are shown in Figure 8.

## PRINCIPAL SOURCES

### Mine No. 5177

This mine was located near the mouth of Saxman Run adjacent to Route 981. The original slope opening was destroyed when Route 981 was widened to four lanes. During construction, a culvert was placed under the new road bed and the 2,269 gpm discharge drains under the highway via the culvert to Saxman Run. This old opening reportedly serves as a common drainway for a series of

## TABLE 12

| Mine No. | Type of Mine | Flow (gpm) | pH | Specific [1/] Conductance | Acidity mg/1 | Acidity lb/day | Receiving Stream |
|---|---|---|---|---|---|---|---|
| 5163 | Drift Mine | 50 | 2.8 | 1800 | 955 | 688 | Unnamed trib to Getty Run |
| 5164 | Drift Mine | 45 | 2.6 | 2200 | 1,085 | 586 | Unnamed trib to Getty Run |
| 5170 | Drift Mine | 240 | 2.0 | 2500 | 1,410 | 4,060 | Getty Run |
| 5171 | Drift Mine | 45 | 2.9 | 3700 | 1,740 | 940 | Getty Run |
| 5173 | Drift Mine | 50 | 2.7 | 3250 | 1,560 | 936 | Unnamed trib to Getty Run |
| 5176 | Drift Mine | 25 | 2.8 | 3000 | 1,390 | 417 | Unnamed trib to Getty Run |
| 5177 | Shaft Mine | 2,269 | 4.4 | 1250 | 455 | 12,389 | Saxman Run |
| 5263 | Strip Mine | 105 | 3.1 | 1800 | 360 | 454 | Unnamed trib to Mill Creek |
| 5351 | Refuse Pile | 70 | 2.7 | 4000 | 2,295 | 1,928 | Ninemile Run |
| 5355 | Refuse Pile | 80 | 4.1 | 1900 | 935 | 898 | Crabtree Creek |
| 5356 | Shaft Mine | 5,097 | 7.4 | 2500 | 320 | 19,572 | Crabtree Creek |
| 5361 | Shaft Mine | 70 | 3.1 | 5000 | 1,080 | 907 | Fourmile Run |
| 5362 | Shaft Mine | 65 | 3.2 | 5025 | 1,070 | 835 | Fourmile Run |
| 5363 | Shaft Mine | 62 | 7.4 | 3700 | 575 | 428 | Loyalhanna Creek |
| 5364 | Shaft Mine | 1,990 | 7.4 | 3700 | 730 | 17,432 | Loyalhanna Creek |
| TOTALS |  | 10,273 |  |  |  | 62,470 |  |

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1/ Specific conductance measured as micromhos/cm.

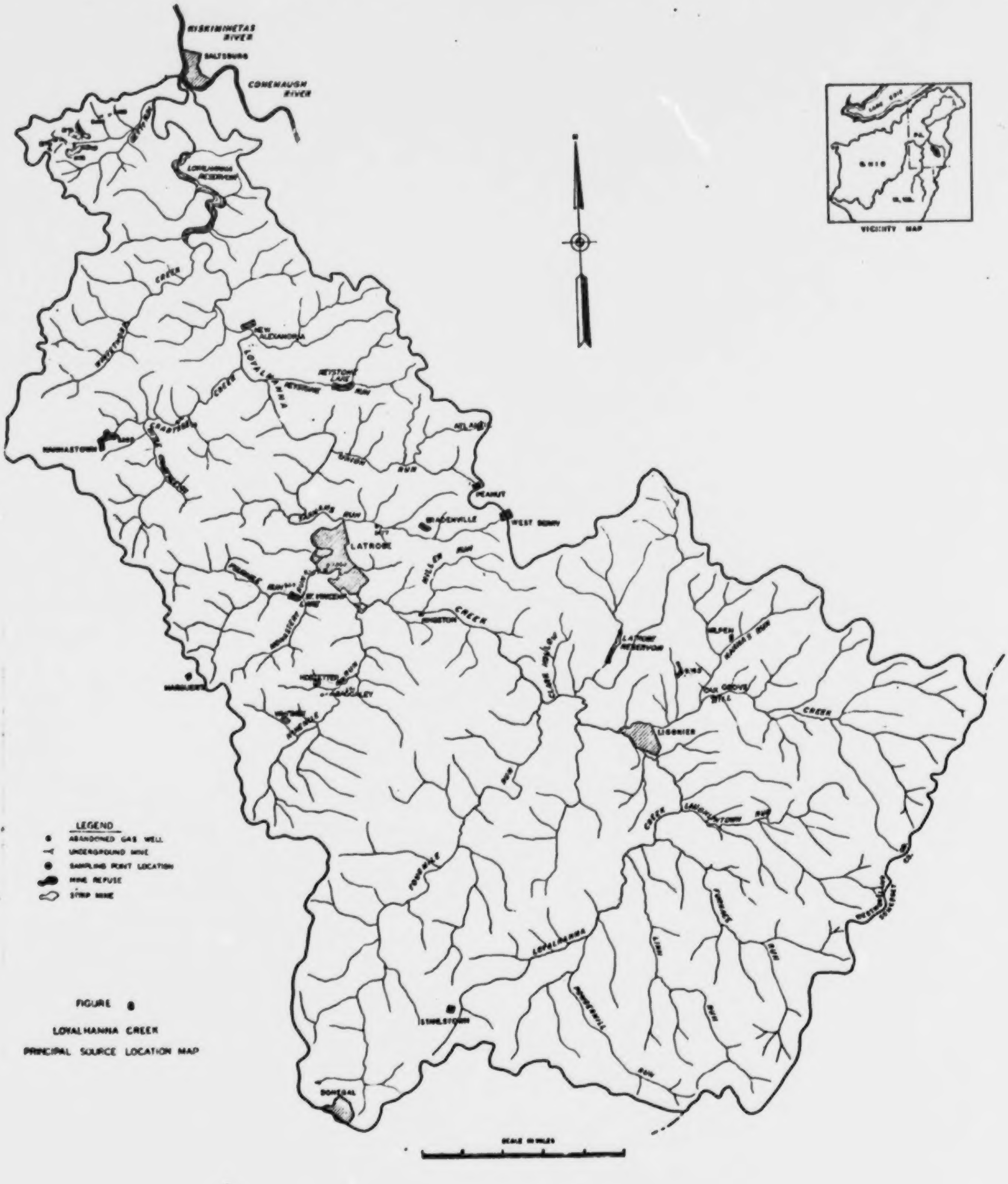
KISKIMINETAS RIVER
SALTSBURG
CONEMAUGH RIVER
LOYALHANNA RESERVOIR
VICINITY MAP
OHIO
NEW ALEXANDRIA
KEYSTONE LAKE
KEYSTONE RUN
LOYALHANNA CREEK
YOUNGSTOWN
ATLANTIC
UNION RUN
PEANUT
WEST DERRY
CRABTREE
LATROBE
SLADESVILLE
MILLER RUN
KINGSTON
LATROBE RESERVOIR
BAGGETTS
HOSTETTER
WILPEN
HANNA'S RUN
OAK GROVE
DARLINGTON
LIGONIER
MILL CREEK
LAUGHLINTOWN RUN
FOURMILE RUN
LINN RUN
STAHLSTOWN
DONEGAL
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE
SCALE IN MILES

FIGURE 8

LOYALHANNA CREEK

PRINCIPAL SOURCE LOCATION MAP

interconnected shaft or slope mines in the surrounding area east and north of Latrobe.

Mine No. 5356

At the time of the survey, Mine No. 5356 represented the largest single source of mine drainage discharge in the Loyalhanna Creek watershed. The discharge was 5,097 gpm and carried an acid load of 19,572 lb/day. The drainage flowed from a concrete culvert at the base of the railroad bed just east of the community of Crabtree. During periods of low flow conditions, the effluent from this mine represents nearly the entire flow in Crabtree Creek. It was reported that the discharge point serves as a common drainway for other large underground mines which were located in this general area. There were no discharges located at any of these other mines.

Mine No. 5364

The discharge from Mine No. 5364 was located along the bank of Loyalhanna Creek just downstream from the confluence of Monastery Run. At this point, a horizontal pipe extending from the bank, several feet above stream level, discharged an effluent of 1,990 gpm which carried an acid load of 17,860 lb/day. At least a portion of this total discharge is associated with the abandoned St. Vincent Mine. Five other discharge points were located in the surrounding area (Mine No.'s 5559, 5260, 5261, 5262 and 5263). It is assumed that these discharges are also associated with the St. Vincent Mine.

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A local resident reported that the horizontal pipe was installed in an attempt to drain the water from the mine as rapidly as possible. Before installation of the pipe, the drainage was discharged to the surface by a number of boreholes and natural drainways. The five discharges listed above may represent points where that part of the total discharge, which exceeds the capacity of the pipe, is discharged to the surface. At the time of sampling, an estimated 50-100 gpm of additional drainage was forced through the strata surrounding the pipe at the major discharge site (No. 5364).

As is the case with Mine No.'s 5177 and 5356, the effluent from Mine No. 5364 is believed to represent a cumulative discharge from other mines interconnected with the St. Vincent Mine. Such mines could include those at Baggaley, Hostetter, and Whitney. The discharge point may even drain mines outside the Loyalhanna Creek watershed such as the mine at Marguerite. This abandoned mine is located near the headwaters of Sewickley Creek which drains to the Monongahela River.

### Mine No.'s 5163 and 5164

These mines are located on an unnamed tributary to Getty Run. Both mines were hillside drifts directly across from each other on opposite banks of a small tributary. A small refuse pile was associated with each mine indicating that neither mine was developed to any large extent. The acid loads from Mine No.'s 5163 and 5164 were 688 lb/day, and 586 lb/day, respectively.

### Mine No. 5170

This mine was located near the headwaters of Getty Run where Route 819 crosses the stream. It was not determined if the discharge point represented an old mine opening or whether this was a drainway for the numerous mines in the area. The opening is adjacent to the railroad tracks immediately behind St. Sylvester Church. The discharge was 240 gpm and carried an acid load of 4,060 lb/day.

### Mine No. 5171

Mine No. 5171 was located downstream of Mine No. 5170 on the same side of Getty Run. The opening was located about 30 feet above stream level and discharged 45 gpm. The acid load was 940 lb/day.

### Mine No. 5173

This mine contributed a discharge of 50 gpm which carried an acid load of 936 lb/day. The area had originally been deep mined and was then strip mined at a later time. A local resident stated that underground mines were in limited operation as far back as 1853. In addition to this major discharge point, an acid load of 35 lb/day was contributed by the fanway opening to the mine.

## Mine No. 5176

This mine opening may be interconnected with Mine No.'s 5171 and 5172. The openings are at approximately the same elevation on opposite sides of the same hill. The opening at No. 5176 has completely caved and the 25 gpm effluent discharges from the base of the slumped area. The outcrop coal on both sides of this mine has been removed by surface mining. These operations have created numerous points of intersection with the underground mine voids.

## Mine No. 5263

Mine No. 5263 is the only surface mine site classified as a principal source in the Loyalhanna Creek watershed. The mine was located on an unnamed tributary to Mill Creek west of the community of Oak Grove. There were actually two surface mine sites near the headwaters of the tributary. There were no major discharge points emanating from either surface mine. However, considerable seepage was present along the downslope perimeter of both mines. This seepage has a cumulative effect which was responsible for the degraded water quality in the tributary. The acid load measured in the stream below the mined areas was 454 lb/day.

## Site No. 5351

A large mine refuse dump near the communities of Hostetter and Baggaley contributed an acid load of 1,928 lb/day to an unnamed tributary of Ninemile Run. There was no discharge from an underground mine at this site. The degraded water quality of the small tributary was a direct result of the refuse pile. This pile is located immediately adjacent to the tributary along an area about 0.4 mile in length.

### Site No. 5355

Below the large mine refuse dump at Hannastown, Crabtree Creek carried an acid load of 898 lb/day. The gradual accumulation of seepage at the base of the refuse pile and the subsequent discharge to Crabtree Creek results in the acid condition found in the stream.

### Mine No.'s 5361, 5362 and 5363

The acid loads contributed by these mine site discharge points were 907 lb/day, 835 lb/day, and 428 lb/day, respectively. They are considered in this section as individual discharge points but actually they are associated with the major discharge found at Mine No. 5364 (See Mine No. 5364, page 99 ).

No. 5361 and 5362 were located on Fourmile Run above St. Vincent Lake. The discharges were artesian in nature and responsible for the somewhat swampy area found above the lake. Several other areas were located along the banks of Fourmile Run which appeared to contribute additional drainage during other hydrologic periods.

A vertical pipe emerging from the stream bed in the middle of Loyalhanna Creek was the source of the effluent found at No. 5363. This pipe was located only a few feet downstream of the major discharge point, No. 5364. This second effluent was 62 gpm and carried an acid load of 428 lb/day.

# CONEMAUGH RIVER, MAIN STEM AND MINOR TRIBUTARIES
# MINE DRAINAGE INVENTORY

## CONEMAUGH RIVER

## SUMMARY AND CONCLUSIONS

1. The Conemaugh River and its minor tributaries drain an area of 310 square miles. The entire 51 mile length of the Conemaugh River from its formation at Johnstown to its confluence with Loyalhanna Creek at Saltsburg is severely polluted as a result of coal mine discharges. This water quality degradation results from mine discharges within the drainage boundary as well as from massive amounts of mine drainage inflow contributed by Stony Creek, Blacklick Creek, and the Little Conemaugh River.
2. A total of 36 discharging sources and approximately 1,700 acres of surface mined area were investigated in the study area. Discharges from the coal mine sources ranged from one to 1,710 gpm and totalled over 4.3 million gallons per day (mgd). The total net acid load discharged by the 36 sources was 35,104 lb/day.
3. There was only one active underground mine in operation at the time of the survey. This was Mine No. 5200 which contributed an alkaline load of 8 lb/day. Abandoned drift mines and coal refuse piles were the major sources of pollution in the sub-basin. These sources contributed more than 80 percent of the total net acid load discharged by all sources in the watershed.
4. A total of six principal sources of mine drainage discharge were located in the Conemaugh River and minor tributaries sub-basin. These sources discharged a total net acid load of 30,495 lb/day.

This represents approximately 86 percent of the acid load contributed by all discharging sources.

## DESCRIPTION OF AREA

The Conemaugh River is formed by the confluence of Stony Creek and the Little Conemaugh River at Johnstown, Pennsylvania. From this point, the river flows generally north and west some 51 miles to its confluence with Loyalhanna Creek at Saltsburg, Pennsylvania. The confluence of Loyalhanna Creek and the Conemaugh River form the Kiskiminetas River. The drainage area of the Conemaugh River and minor tributaries is 310 square miles. This does not include the drainage areas of major tributaries such as the Little Conemaugh River, Stony Creek, Blacklick Creek or Two Lick Creek. These major drainage areas are included as separate sub-basin reports.

## STREAM WATER QUALITY

As a result of the grossly polluted acid condition of both the Little Conemaugh River and Stony Creek, and additional acid discharges received by the main stem, the Conemaugh River is severely polluted by coal mine drainage over its entire 51 mile length. The river bed and high water levels are heavily stained and coated with precipitated iron compounds resulting from the mine drainage discharges. Alkaline tributary inflow entering the river is immediately assimilated with no water quality improvement in the main stem.

During the course of the field study, several stream locations were sampled for chemical analysis (Table 13, Figure 9). These stations were selected to measure the cumulative effects of mine drainage. A summary of this data is presented in Table 14. The water quality data collected from Stony Creek at Riverside and from the Little Conemaugh River at East Conemaugh are included. This data reflects the background water quality of the tributaries which form the Conemaugh River.

With the exception of Tubmill Creek, all of the streams shown in Table 13 are affected in varying degrees by mine drainage discharges over their entire length. The major mine discharge points on Tubmill Creek which degrade the water quality of the stream are located near the mouth of the tributary. Although there were a few mine discharges located in the headwater area, they had little effect upon the water quality of the stream.

The sources of pollution inventoried in the Conemaugh River subbasin were limited to those sources emanating from active or abandoned coal mine operations. No attempt was made to document pollutional discharges of a different source type. Although mine drainage is the major source of pollution in most of the streams in the Kiskiminetas River basin, pollution problems from sources other than mine drainage do exist. The effects upon the water quality of the Conemaugh River, Little Conemaugh River, and Stony Creek from steel mill and other industrial discharges were not documented. During the course of the field study, discharges from such sources were located along the banks

## TABLE 13

### Stream water quality sampling stations, Conemaugh River main stem and minor tributaries

| Station No. | Sampling Period | Stream | Location |
|---|---|---|---|
| 4792 | May, 1968 | Two Lick Creek | Near Mouth |
| 4984 | June, 1968 | Two Lick Creek | Near Mouth |
| 4983 | June, October, 1968 | Blacklick Creek | USGS gage at Josephine |
| 5261 | July, December, 1968<br>January, 1969 | Little Conemaugh River | USGS gage at East Conemaugh |
| 5382 | August, October and November, 1968 | Stony Creek | USGS gage at Riverside |
| 5619 | October, November and December, 1968 | Conemaugh River | USGS gage at Tunnelton |
| 5620 | October, November, 1968<br>January, 1969 | Richards Run | Near Mouth |
| 5621 | October, November, 1968<br>January, 1969 | Tubmill Creek | Near Mouth |
| 5625 | October, November and December, 1968 | Aultmans Run | Near Mouth |

# Table 14

## Stream water quality data
## Conemaugh River-mainstem and minor tributaries

| Station Number | Sampling Date | Flow (gpm) | pH | Specific Conductance | Total Acidity mg/l | Total Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4792 | May 10, 1968 | 58,500 | 4.4 | 560 | 60 | 42,120 | 186 | 130,572 | 250 | 175,500 | 7.0 | 4,914 | 1.7 | 1,193 | 4.6 | 3,229 |
| 4792 | May 15, 1968 | 223,200 | 4.4 | 540 | 84 | 224,985 | 90 | 241,056 | 145 | 388,368 | 4.2 | 11,249 | 0.9 | 2,411 | 4.0 | 10,714 |
| 4984 | June 12, 1968 | 103,330 | 3.2 | 850 | 205 | 254,191 | 133 | 164,915 | 320 | 396,787 | 13.1 | 16,243 | 2.1 | 2,604 | 10.9 | 13,516 |
| 4983 | June 12, 1968 | 108,000 | 2.8 | 1400 | 430 | 557,280 | 127 | 164,592 | 600 | 777,600 | 38.0 | 49,284 | 2.3 | 2,981 | 21.5 | 27,864 |
| 4983 | June 26, 1968 | 40,500 | 2.9 | 2000 | 615 | 298,890 | 190 | 92,340 | 900 | 437,400 | 56.5 | 27,459 | 3.5 | 1,701 | 36.9 | 17,933 |
| 4983 | Oct. 16, 1968 | 14,850 | 2.6 | 2600 | 800 | 142,560 | 236 | 42,055 | 1230 | 219,186 | 85.4 | 15,218 | 5.3 | 944 | 35.5 | 6,326 |
| 5261 | July 9, 1968 | 22,500 | 2.9 | 2900 | 435 | 117,450 | 420 | 113,400 | 770 | 207,900 | 43.3 | 11,691 | 6.9 | 1,863 | 17.9 | 4,833 |
| 5261 | Dec. 3, 1968 | 159,300 | 4.7 | 650 | 195 | 372,762 | 117 | 223,657 | 355 | 678,618 | 16.6 | 31,732 | 2.0 | 3,823 | 4.1 | 7,838 |
| 5261 | Jan. 3, 1969 | 114,750 | - | - | 57 | 78,489 | 29 | 39,933 | 10 | 13,770 | 2.2 | 3,029 | 0.1 | 138 | 1.8 | 2,479 |
| 5382 | Aug. 21, 1968 | 124,200 | 3.8 | 1250 | 1,130 | 1,684,152 | 280 | 417,312 | 495 | 737,748 | 3.4 | 5,067 | 3.2 | 4,769 | 9.1 | 13,563 |
| 5382 | Oct. 31, 1968 | 10,800 | 3.6 | 1500 | 290 | 37,584 | 290 | 37,584 | 580 | 75,168 | 13.4 | 1,737 | 3.7 | 480 | 2.3 | 298 |
| 5382 | Nov. 14, 1968 | 36,000 | 4.6 | 800 | 22 | 9,504 | 166 | 71,712 | 360 | 155,520 | 9.5 | 4,104 | 1.9 | 821 | 7.0 | 3,024 |
| 5619 | Oct. 30, 1968 | 99,000 | 3.2 | 1400 | 265 | 314,820 | 242 | 287,496 | 500 | 594,000 | 11.1 | 13,187 | 1.9 | 2,257 | 5.9 | 7,009 |
| 5619 | Nov. 13, 1968 | 446,400 | 3.6 | 700 | 120 | 642,816 | 135 | 723,168 | 210 | 1,124,928 | 14.2 | 76,067 | 3.4 | 18,213 | 7.1 | 38,033 |
| 5619 | Dec. 4, 1968 | 850,000 | 5.3 | 490 | 125 | 1,275,000 | 88 | 897,600 | 185 | 1,887,000 | 8.9 | 90,780 | 1.3 | 13,260 | 5.2 | 53,040 |
| 5620 | Oct. 30, 1968 | 420 | 3.7 | 1300 | 300 | 1,512 | 344 | 1,734 | 795 | 4,007 | 12.2 | 61 | 4.7 | 24 | 13.3 | 67 |
| 5620 | Nov. 19, 1968 | 8,256 | 4.9 | 480 | 145 | 14,365 | 60 | 5,944 | - |  | 14.6 | 1,446 | 1.1 | 109 | 8.8 | 872 |
| 5620 | Jan. 3, 1969 | 600 | - | - | 139 | 1,000 | 44 | 317 | 100 | 720 | 14.6 | 105 | 0.8 | 6 | 6.4 | 46 |
| 5621 | Oct. 30, 1968 | 2,580 | 7.8 | 440 | 150 | 4,644 | 79 | 2,446 | 125 | 3,870 | 5.6 | 173 | 4.2 | 130 | 3.5 | 108 |
| 5621 | Nov. 19, 1968 | 73,185 | 7.4 | 200 | 106 | 93,091 | 41 | 36,007 | - | - | 1.0 | 878 | 0.1 | 88 | 2.9 | 2,547 |
| 5621 | Jan. 3, 1969 | 53,550 | - | - | 162 | 104,101 | 144 | 92,534 | 110 | 70,686 | 1.9 | 1,221 | 0.9 | 578 | 4.5 | 2,892 |
| 5625 | Oct. 31, 1968 | 425 | 4.2 | 1500 | 345 | 4,760 | 256 | 1,306 | 620 | 3,162 | 1.7 | 9 | 7.3 | 37 | 20.5 | 105 |
| 5625 | Nov. 19, 1968 | 21,041 | 5.5 | 500 | 146 | 36,863 | 92 | 23,229 | - | - | 4.0 | 1,010 | 1.5 | 379 | 5.1 | 1,288 |
| 5625 | Dec. 4, 1968 | 57,498 | 5.2 | 400 | 155 | 106,946 | 134 | 92,457 | 145 | 100,047 | 33.0 | 22,769 | 1.7 | 1,173 | 6.6 | 4,554 |

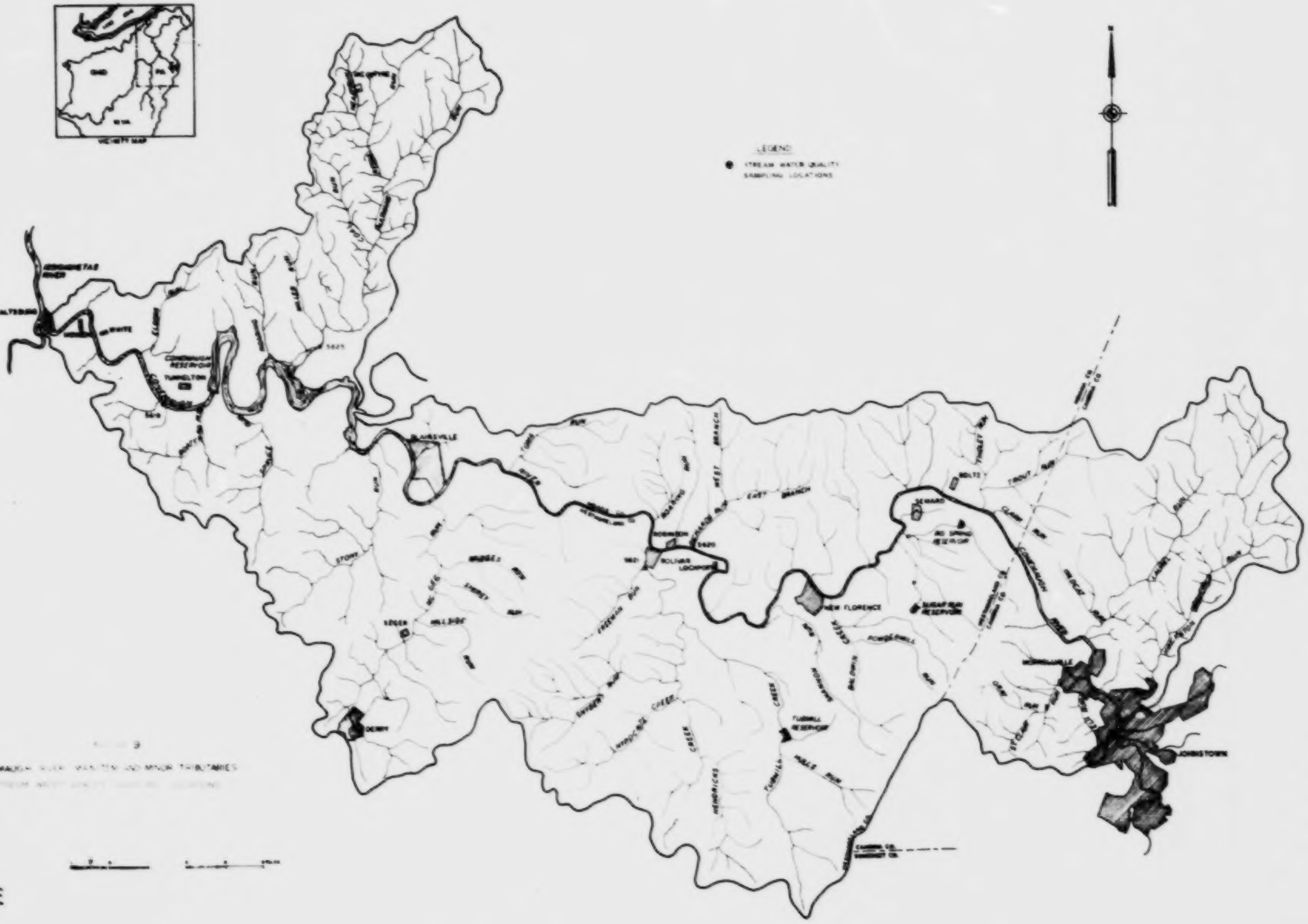
VICINITY MAP
OHIO
W. VA.
PA.
LEGEND
● STREAM WATER QUALITY SAMPLING LOCATIONS
KISKIMINETAS RIVER
SALTSBURG
CONEMAUGH RESERVOIR
TUNNELTON
BLAIRSVILLE
BOLIVAR
NEW FLORENCE
SEWARD
JOHNSTOWN
DERRY
WEST BRANCH
EAST BRANCH
HENDRICKS CREEK
TUBMILL CREEK
TUBMILL RESERVOIR
SUGAR RUN RESERVOIR
BIG SPRING RESERVOIR
HILLSIDE
MILLER RUN
STONY RUN
CLARK RUN
TROUT RUN
CONEMAUGH RIVER
CAMBRIA CO.
WESTMORELAND CO.

FIGURE 9

CONEMAUGH RIVER MAINSTEM AND MINOR TRIBUTARIES

STREAM WATER QUALITY SAMPLING LOCATIONS

of the above mentioned streams. This was particularly evident in the Johnstown and nearby community areas.

## SOURCES OF MINE DRAINAGE

A description of the mine drainage sources in the Conemaugh River sub-basin follows. All mine location sites inventoried during the study are shown in Figure 10 following the source description section.

### Hinckston Run

Only one source of mine drainage discharge was located in the 15 square mile drainage area of Hinckston Run. The discharge rate was 72 gpm which carried a net alkaline load of 101 lb/day. The discharge emerged from a small opening in the hillside adjacent to the road. It did not appear that a mine portal was located in this area; however, the opening may serve as a drainway for a mine in another location. The hillside along much of the east bank of Hinckston Run was actively in use as a slag dump by one of the nearby mills.

### St. Clair Run

Six surface mines and 12 drift mine openings were located on this small tributary. The only source of mine drainage was from Mine No. 5365. This mine was an open drift located nearly 200 feet vertical below a circular hilltop surface mine. The acid load discharged by Mine No. 5365 was 121 lb/day.

## Conemaugh River - below Johnstown

Mine No. 5181 and 5182 were located along the Conemaugh River at Coopersdale on the north side of Johnstown. Between this point and the downstream community of Seward (about 6 miles) there were no mines located on either the main stem of the river or on any of the tributaries to the river.

Mine No.'s 5181 and 5182 were located behind the Haws Refractory Plant on Route 403. Both mines were abandoned; however, it appeared that Mine No. 5181 had recently been closed. Both the portal and airway were still open. Mine 5182 had been abandoned for some time. The opening had completely slumped and the drainage emerged via pipe from the base of the caved opening. The acid load discharged by Mine No. 5182 was 150 lb/day and Mine No. 5181 contributed a negligible alkaline load.

The next downstream coal mine operation was located along the north bank of the Conemaugh River just east of the small community of Boltz. A large underground mine was located in this area; however, the mine openings have been closed and covered. A refuse pile of several acres is associated with the mine. At the time of inspection, there was no drainage from either the caved mine openings or from the refuse pile. A series of 4 boreholes were located on the west side of Boltz. All but one of these openings were capped or sealed.

Two dry drift mine openings were located along the opposite bank of the river directly across from Boltz. Both mines were driven directly under Route 56, about 0.6 mile upstream of the community of Seward. A borehole discharge of 300 gpm was located near the downstream area of Seward. There were two boreholes at this site; however, the total discharge was contributed by one opening. The acid load carried by this effluent (No. 5366) was 3,545 lb/day.

The active underground Conemaugh No. 1 Mine of the North American Coal Corporation is located directly across from Mine No. 5366 on the opposite bank of the Conemaugh River. This was one of two active mine operations in this sub-basin area which were not inventoried during the field study. Recent information supplied by the Commonwealth of Pennsylvania indicates that this mine produces an alkaline effluent and treatment is not required. An air shaft for this mine is located near Hedges Lake.

## Big Spring Run, Sugar Run, Baldwin Run

These tributaries were the next downstream areas on which coal mine operations were located. A total of four drift mines, one strip mine, and one combination surface-underground mine were located on these tributaries. All of the mines were dry and it did not appear that the mines contributed any more than insignificant amounts of seepage to the receiving tributaries. The pH and conductivity values measured at the mouth of these streams ranged from 6.9 to 8.0 and from 90 to 170 micromhos/cm, respectively.

## Conemaugh River - main stem

Mine No. 5367 was located along the bank of the Conemaugh River approximately 0.8 mile upstream of the small community of Lockport. Two openings to the mine were located. The effluent was 17 gpm which discharged an acid load of 694 lb/day directly to the river.

The Robinson Mine of the Florence Mining Company was located on the Conemaugh River east of the community of Robinson. This active underground mine was not inventoried during the field survey. Recent information supplied by the Commonwealth of Pennsylvania indicates that the Robinson Mine is now interconnected with several additional active mines. At the present, three of the four discharges from this underground complex are alkaline. Adequate treatment is provided for the one acid discharge.

## Richards Run

A total of 15 drift mine openings and one surface mine were located within the seven square mile drainage area of this tributary.

The first two discharging mines were located on the East Branch of Richards Run. At Mine No. 5186 an acid load of 39 lb/day was discharged by a caved drift mine opening. A second discharging mine (No. 5185) was located about 100 yards upstream of Mine 5186. At the time of the field survey, Mine No. 5185 was in the process of being sealed. The mine had only recently been closed and workmen were installing mine seals at the three openings to the mine. Two of these three openings discharged a combined effluent of 207 gpm. However, the discharge was essentially neutral as the acid load was only 10 lb/day. These openings were sampled before the installation of the mines seals was completed.

The other area of mine drainage discharge on this tributary was located near the headwaters of the West Branch. A 15 gpm discharge was sampled at Mine No. 5184. This opening is probably interconnected with four additional openings in the immediate area. The acid load carried by this effluent (No. 5184) was 117 lb/day. A second discharge was located across the road from Mine No. 5184. At this site a total of 4 drift openings in two different coal seams were inspected. Two of the openings were caved drift portals and the other two openings were slope entries for a new mine under development. The only source of drainage from this mine site was seepage from a refuse pile. The acid load contributed by this source (No. 5183) was 274 lb/day.

Stream sampling at the mouth of Richards Run, conducted coincident with the mine inventory, indicated that acid loads ranging from 1,000 lb/day to 14,365 lb/day (Tables 13, 14) were discharged by this tributary to the Conemaugh River.

Below the mouth of Richards Run a small unnamed tributary enters the Conemaugh River near the community of Robinson. Four surface mines and six drift mine openings were located on the tributary. Four of the mine discharges (Mine No.'s 5192, 5193, 5194 and 5195) result from points of intersection between underground and surface mine operations. The combined acid load of these four discharges was 522 lb/day. The major part of this acid load (316 lb/day) was contributed by Mine No. 5195. An additional acid load of 22 lb/day was discharged by Mine No. 5197, a small drift mine not connected with the surface mine operations.

## Tubmill Creek

Tubmill Creek is a major tributary of the Conemaugh River. With the exception of a few scattered surface mines in the headwater area and the drift mines near its mouth, Tubmill was unaffected by mine drainage over nearly its entire 66 square mile drainage area.

Only two discharging mine sites were located on the headwater tributaries to Tubmill Creek. These were Mine No.'s 5276 and 5277 on Hypocrite Creek. The total acid load discharged by these mines was 54 lb/day.

Mine No. 5278 was located on Tubmill Creek approximately 2 miles above the mouth of the tributary. At this point, an effluent of 185 gpm was discharged to Tubmill Creek. The acid load of this discharge was 2,098 lb/day. This discharge also imported a very noticeable discoloration to the downstream length of Tubmill Creek. The mine appears quite limited in the extent of development; however, a local resident reported that this mine intersected and abandoned workings of a much larger mine. Below this point and the next downstream sources of mine drainage, additional mines were located but they were dry. Mine No.'s 5368 and 5369 discharged a cumulative effluent of 45 gpm which carried a combined acid load of more than 900 lb/day. In this area, a series of "punch holes" had been driven into the exposed coal seam. A total of eight openings were located; however, only mine No.'s 5368 and 5369 were discharging at the time of inspection.

One additional major source of mine drainage discharge was located on Freeman Run. This stream is a tributary of Tubmill Creek and joins the main stem about 0.5 mile above its mouth. Mine No. 5370 discharged an acid load of 429 lb/day to Freeman Run. Five additional openings were located in this same general area but were dry.

Stream sampling near the mouth of Tubmill Creek, conducted coincident with the mine drainage survey, indicated that Tubmill Creek discharged an acid load ranging from 4,644 lb/day to 104,101 lb/day to the Conemaugh River (Tables 13, 14).

### McGee Run

Only one discharging mine site was located in the 26 square mile drainage area of McGee Run. Several other mines were investigated but found dry. A large underground mine was located near the community of Seger. The mine openings was caved and did not contribute any drainage. However, a large refuse pile associated with the mine degrades the water quality of the small unnamed tributary to McGee Run which drains the area. An acid load of 387 lb/day was measured in the tributary below the refuse pile (No. 5373).

Six drift mine openings and two surface mines were located along the downstream length of McGee Run, however, these sites were dry.

### Conemaugh River, main stem

The largest acid load in the Conemaugh River main stem and minor tributaries sub-basin study area was located along the south bank of the river 0.1 mile below the confluence of McGee Run. A 1,710 gpm discharge was measured at this site (No. 5371). This discharge point probably serves as a common drainway for several interconnected underground mines in the surrounding area. Such mines would include the Brenizer Mine on McGee Run and several slope mines on the next downstream tributary, Stony Run. The acid load contributed by the 1,710 gpm effluent was 17,545 lb/day. A second drainage point was located adjacent to No. 5371. This was No. 5372 which discharged an additional effluent of 5 gpm carrying an acid load of 32 lb/day.

## Stony Run

Approximately seven surface mines and 16 underground mine openings were investigated on Stony Run. There were no discharges located at any of these mine sites. As mentioned above, these mines may be drained by the large discharge point located along the bank of the Conemaugh River.

## Altmans Run

The upper 75 percent of the Altmans Run drainage area has been extensively mined by both surface and underground operations. Several of the surface mines are quite large covering areas in excess of 100 acres.

A large underground mine was located near the headwaters of Neal Run, a tributary to Altmans Run, in the community of McIntyre. The portal to the mine had been sealed and there was no discharge. There are two mine refuse dumps directly across from the McIntyre Mine. Considerable seepage was present about the perimeter of these areas. Sample No.'s 5562 and 5563 indicated that the cumulative seepage from these piles contributed acid loads of 225 lb/day and 3,600 lb/day respectively. The effluent from No. 5562 drained to an unnamed tributary of Reeds Run and No. 5563 drained to Neal Run.

Another significant acid load was discharged to Reeds Run by a refuse dump near the headwaters of the tributary. There was no mine opening located near this dump area and it appears that the refuse may have been trucked from McIntyre. The acid load contributed by this source, No. 5564, was 2,079 lb/day.

Mine No. 5565 was a slumped drift mine opening in the base of a surface mine highwall. The acid load discharged by this mine was 162 lb/day. A small unnamed tributary which enters Reeds Run near its mouth contributed an acid load of 1,627 lb/day to the stream. This small tributary receives significant amounts of seepage from a large surface mined area. There were no major point sources of discharge, however, the water quality of the tributary is grossly degraded by the cumulative seepage from the surface mine. The tributary carried an acid load of 1,627 lb/day near its mouth (No. 5566).

A small tributary to Altmans Run carried an acid load of 49 lb/day below a surface mined area. This effluent (No. 5568) was the only source of mine drainage discharge located on Altmans Run above the confluence with Reeds Run.

Two extensive surface mined areas were located on Altmans Run and its tributaries south of Route 286. Several underground openings were also located in the highwalls of these strip mines. Two active underground mines were in operation at the time of the survey. These were the No. 1 and No. 2 mines of the C & C Coal Company. The No. 1 mine was in operation at the time of inspection and a 4 gpm effluent was discharged via the fanway. The effluent was alkaline. The No. 2 mine was under development and at the time had penetrated the coal seam to only a minimal extent. Both of these operations were on Coal Run which is a tributary to Altmans Run.

A highly acid discharge was located on Coal Run within the same surface mined area in which the C & C #2 mine was located. A portion of the surface mine was used for mine refuse disposal. This waste material was spread and compacted over several acres of strip mine spoil piles. An effluent of only 2 gpm was found near the base of the refuse area. However, the acidity concentration of this effluent was 8,950 mg/l (No. 5199). A considerable number of trees and other vegetation have been destroyed by the seepage from the refuse pile.

Two large strip mine ponds near the confluence of Coal Run and Altmans Run were sampled during the survey. There was no surface discharge at the time of sampling, however, the ponds may contribute drainage during high flow periods or by subsurface seepage through the the spoil piles. These were No.'s 5569 and 5570 with acidity concentrations of 240 mg/l and 176 mg/l, respectively.

There were no sources of mine drainage below the confluence of Coal Run with Altmans Run. However, the acid condition of Altmans Run persisted over the entire remaining downstream length of the tributary.

Stream sampling near the mough of Altmans Run, conducted coincident with the mine drainage inventory, indicated that this stream discharged an acid load ranging from 1,760 lb/day to 106,946 lb/day to the Conemaugh River (Tables 13, 14).

### Conemaugh River, main stem

Only a few mine operations were located in the area of the basin below the confluence of Altmans Run. All but one of these operations were drift or slope mines located along the banks of the Conemaugh River. The one exception was a dry surface mine near the headwaters of Boatyard Run.

The active Marion Mine of the Tunnelton Mining Company is located along the north bank of the Conemaugh River just east of the community of Tunnelton. This mine is developed to the dip and has a pumped discharge. The mine is listed as "in compliance" according to information supplied by the Commonwealth.

Several additional mines were investigated along the remaining downstream length of the Conemaugh River. Such mines included those located in the coal towns of White and Moween. The only source of mine drainage discharge was from No. 5529. This discharge point did not appear to represent a mine portal but rather it appeared to represent a point where an underground mine had broken through to the surface. The acid load carried by this 22 gpm effluent was 207 lb/day.

A total of 36 discharging sources and approximately 1,700 acres of surface mined area were investigated during this study. Table 15 presents an area breakdown in terms of total flow and total loading (lb/day) of polluting constituents discharged to receiving streams in the Conemaugh River main stem study area. Table 16 presents a summary of flow volumes and chemical loading by source type for the 36 discharging sources inventoried during the study.

## Table 15

Mine drainage loadings by receiving stream
Conemaugh River, main stem and minor tributaries

| Receiving Stream | No.of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Conemaugh River | 8 | 2,150 | 22,195 | 13,623 | 32,988 | 8,138 | 281 | 471 |
| Unnamed tribs to Conemaugh River | 6 | 22 | 597 | 124 | 637 | 126 | 3 | 25 |
| Unnamed tribs to Aultmans Run | 1 | 20 | 49 | 61 | 94 | 0 | 1 | 2 |
| Reeds Run | 1 | 45 | 2,079 | 340 | 2,349 | 667 | 19 | 65 |
| Unnamed tribs to Reeds Run | 4 | 68 | 2,033 | 656 | 2,141 | 103 | 29 | 102 |
| Neal Run | 1 | 12 | 3,600 | 2,604 | 864 | 24 | 5 | 65 |
| Coal Run | 2 | 6 | 207 | 74 | 285 | 40 | 1 | 12 |
| McGee Run | 1 | 150 | 387 | 279 | 504 | 7 | 6 | 24 |
| Freeman Run | 1 | 11 | 429 | 27 | 360 | 41 | 0 | 1 |
| Tubmill Creek | 3 | 230 | 3,014 | 471 | 3,544 | 933 | 6 | 102 |
| Unnamed tribs to Hypocrite Creek | 2 | 30 | 54 | 193 | 254 | 1 | 2 | 3 |
| St. Clair Run | 1 | 3 | 121 | 9 | 140 | 17 | 0 | 8 |
| East Branch Richards Run | 2 | 209 | 49 | 1,724 | 2,288 | 1,434 | 3 | 2 |
| West Branch Richards Run | 2 | 17 | 391 | 111 | 462 | 54 | 2 | 27 |
| Hinckston Run | 10 | 72 | -101 | 683 | 752 | 2 | 2 | 0 |
| TOTALS | 36 | 3,045 | 35,104 | 20,979 | 47,662 | 11,587 | 360 | 909 |

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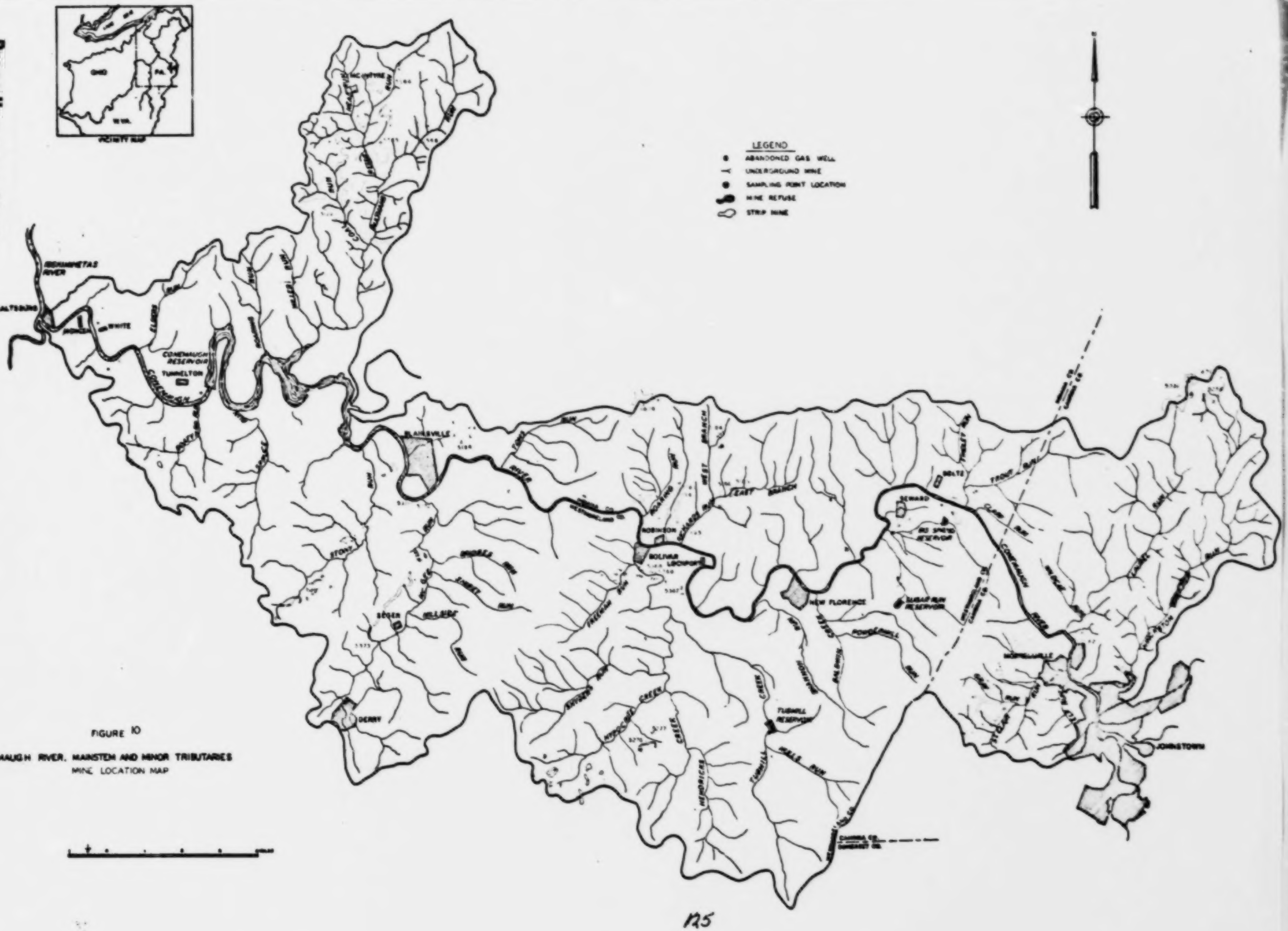
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE
OHIO
PA.
W. VA.
KISKIMINETAS RIVER
SALTSBURG
CONEMAUGH RESERVOIR
TUNNELTON
CONEMAUGH
BLAIRSVILLE
RIVER
ROBINSON
BOLIVAR
LOCKPORT
WEST BRANCH
EAST BRANCH
NEW FLORENCE
SEWARD
BIG SPRING RESERVOIR
SUGAR RUN RESERVOIR
TUBMILL RESERVOIR
TUBMILL CREEK
HENDRICKS CREEK
POWDERMILL RUN
STONY RUN
CLARK RUN
TROUT RUN
BOLTZ
SEGER
DERRY
JOHNSTOWN
COAL RUN
CONEMAUGH RIVER

FIGURE 10

CONEMAUGH RIVER, MAINSTEM AND MINOR TRIBUTARIES
MINE LOCATION MAP

125

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## Table 16

Mine drainage loadings by source type
Conemaugh River, main stem and minor tributaries

| Source Type | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Drift Mines (abandoned) | 23 | 2,427 | 22,890 | 16,469 | 37,805 | 10,221 | 269 | 436 |
| Drift Mine (active) | 1 | 4 | -8 | 29 | 48 | 0 | 0 | 0 |
| Strip Mines (abandoned) | 4 | 95 | 1,734 | 746 | 2,064 | 103 | 26 | 97 |
| Shaft Mine (abandoned) | 1 | 300 | 3,546 | 400 | 3,240 | 490 | 26 | 177 |
| Combination Mine (abandoned) | 1 | 5 | 162 | 15 | 26 | 1 | 0 | 0 |
| Refuse Piles (abandoned) | 6 | 214 | 6,780 | 3,320 | 4,479 | 772 | 39 | 199 |
| TOTALS | 36 | 3,045 | 35,104 | 20,979 | 47,662 | 11,587 | 360 | 909 |

## POLLUTION ABATEMENT

As shown in Table 16, abandoned drift mines are the principal pollution sources within the Conemaugh River main stem and minor tributaries study area. There are also several major sources of mine drainage pollution emanating from other source types. Similar to the main stem Kiskiminetas River, abatement of mine drainage sources in this study area would be of minimal value due to the massive amounts of mine drainage which are discharged to the Little Conemaugh River, Stony Creek, Blacklick Creek, and Two Lick Creek. Significant reduction or even complete elimination of mine drainage in this study area would result in an insignificant water quality improvement in the main stem Conemaugh River. For this reason pollution abatement activities are justified only at such a time when consideration can be given to a total river basin abatement program, or as the final phase of an abatement program which has achieved drainage control on a downstream priority basis. However, abatement of a single source or mine complex within the study area may have merit as a demonstration site for the feasibility study of a particular mine drainage abatement problem.

Based on the initial field survey sampling program, six of the total 36 discharging sties contributed about 87 percent of the total acid load measured in the study area. The combined acid load of these sources was more than 15 tons per day. Assuming previous or concurrent abatement of upstream discharges and similar abatement of the major discharge points on Blacklick Creek and Two Lick Creek, drainage control at these six principal sites should result in a significant water quality improvement in the main stem Conemaugh River.

Perhaps the most significant reduction in acid load from any single source could be attained through drainage control of the large discharge (No. 5371) along the bank of the Conemaugh River below the mouth of McGee Run. This single effluent discharged an acid load of 17,545 lb/day, approximately 50 percent of the total acid load discharged by all sources.

The six principal sources mentioned above can provide a relative indication of where the major mine drainage pollution problems occur in the study area. Detailed engineering studies conducted during an entire water year may necessitate the consideration of additional sources or perhaps deletion of some sources initially considered. Until such a time, these six sources can effectively serve as a first phase or priority in a program of drainage source abatement.

The following is a more detailed description of the six principal sources mentioned above. A listing of these sources is shown in Table 17. The location of these mine sites are shown in Figure 11. All mine sites which contributed an acid load exceeding 1500 lb/day are considered as principal sources.

## PRINCIPAL SOURCES

### Mine No. 5278

This mine is located on Tubmill Creek approximately two miles above the mouth of the tributary. At this point, a series of drift openings have been developed along the coal outcrop. All but one of these openings were dry. The one discharging opening (No. 5278) contributed

Table 17
Principal mine drainage sources
Conemaugh River, main stem and minor tributaries

| Mine No. | Type of Mine | Flow (gpm) | pH | Specific Conductance | Acidity | | Receiving Stream |
|---|---|---|---|---|---|---|---|
| | | | | | mg/l | lb/day | |
| 5278 | Drift mine | 185 | 2.6 | 1,600 | 945 | 2,098 | Tubmill Creek |
| 5366 | Shaft mine | 300 | 2.7 | 2,400 | 985 | 3,546 | Conemaugh River |
| 5371 | Drift mine | 1710 | 4.2 | 3,000 | 855 | 17,545 | Conemaugh River |
| 5563 | Refuse Pile | 12 | 2.3 | 10,600 | 25,000 | 3,600 | Neal Run |
| 5564 | Refuse Pile | 45 | 3.2 | 6,000 | 3,850 | 2,079 | Reeds Run |
| 5566 | Strip Mine | 48 | - | 6,000 | 2,825 | 1,627 | Unnamed trib. to Reeds Run |
| TOTAL | | 2300 | | | | 30,495 | |

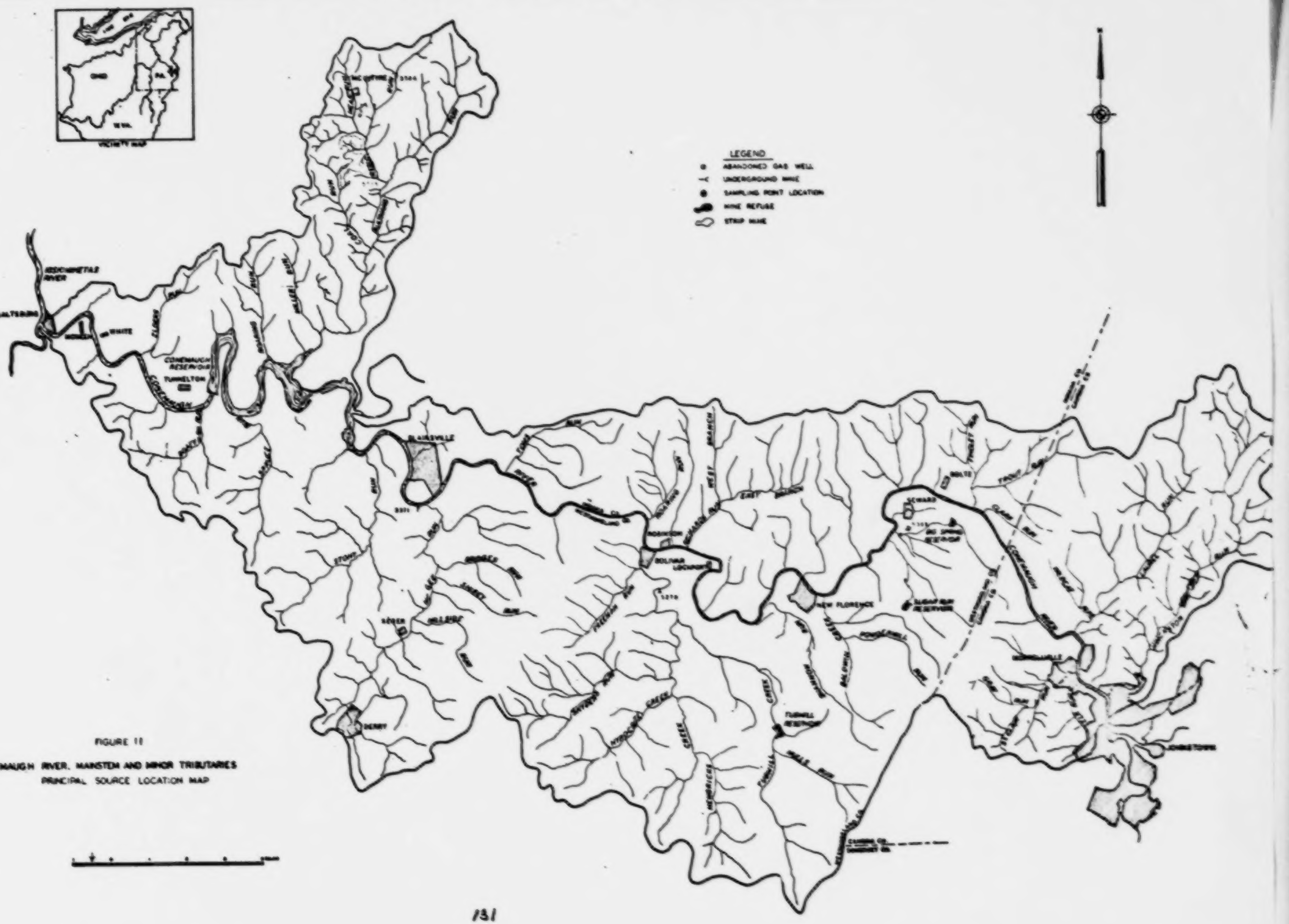
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE
OHIO
PA.
W. VA.
VICINITY MAP
KISKIMINETAS RIVER
SALTSBURG
CONEMAUGH RESERVOIR
TUNNELTON
BLAIRSVILLE
DERRY
BOLIVAR
LOCKPORT
NEW FLORENCE
SEWARD
SUGAR RUN RESERVOIR
TUBMILL RESERVOIR
JOHNSTOWN
CONEMAUGH RIVER
WEST BRANCH
EAST BRANCH
HENDRICKS CREEK
TUBMILL CREEK
MILL CREEK
STONY RUN
CLARK RUN

FIGURE 11

CONEMAUGH RIVER, MAINSTEM AND MINOR TRIBUTARIES
PRINCIPAL SOURCE LOCATION MAP

an effluent of 185 gpm. The acid load carried by this effluent was 2,098 lb/day. This discharge imparts very noticeable discoloration to Tubmill Creek which persists over the remaining downstream length of the stream. The small refuse area associated with this series of mine openings suggests that the mine was limited in the extent of development. A local resident reported that this mine intersected the workings of a larger mine and now serves as a drainway for the larger mine.

**Mine No. 5366**

The effluent from this mine is discharged from a bore hole located along the bank of the Conemaugh River near the community of Seward. There are actually two borehols at the site, however, the second opening was dry. A filled shaft mine opening was located near the discharge point but it was not determined if this mine was the source of the borehole discharge.

**Mine No. 5371**

Mine No. 5371 contributed the largest acid load of any mine located in this study area. The discharge point is located along the south bank of the Conemaugh River immediately below the mouth of McGee Run. The effluent was 1,710 gpm which discharged an acid load of 17,545 lb/day to the river. The discharge point is not a mine portal but rather appears to be an area where a drainway for an underground mine has been constructed. This drainway may represent the common discharge point for several interconnected underground mines. Such mines could

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include the Brenizer Mine as well as other mines located on Stony Run.

No. 5563

A mine refuse pile was responsible for the drainage found at No. 5563. This refuse area is one of several associated with the abandoned McIntyre Mine. At the time of inspection, considerable seepage was present along the downslope side of the refuse pile. This cumulative seepage (12 gpm) discharged an acid load of 3,600 lb/day to Neal Run. The acidity concentration of this effluent was 25,000 mg/l.

No. 5564

Another mine refuse pile was responsible for the drainage at this location. This dump is located near the headwaters of Reeds Run. There was no mine opening located in this immediate area and it appears that the refuse was trucked from McIntyre. The acid load discharged by source No. 5564 was 2,079 lb/day.

Mine No. 5566

An acid load of 1,627 lb/day was discharged to Altmans Run by a small unnamed tributary which enters the stream near the small community of Jacksonville. This unnamed tributary is located adjacent to a large surface mined area which covers more than 100 acres. Seepage was present along the entire downslope side of the distrubed area. There were no major point sources of discharge, however the water quality of the tributary was grossly degraded by the cumulative seepage from the partially reclaimed surface mine.

# BLACKLICK CREEK
# MINE DRAINAGE INVENTORY

## BLACKLICK CREEK

## SUMMARY AND CONCLUSIONS

1. Blacklick Creek and its minor tributaries drain an area of 222 square miles. The entire length of main stem Blacklick Creek between the communities of Vintondale and Blairsville is seriously polluted as a result of coal mine discharges. Two Lick Creek, a major tributary to Blacklick Creek, is considered as a separate sub-basin report.

2. A total of 161 discharging sources and approximately 1,675 acres of surface mined area were investigated in the study area. Discharges from the coal mine sources ranged from one to 3,800 gpm and totalled nearly 36.3 million gallons per day (mgd). The total net acid load discharged by the 161 sources was 273,073 lb/day.

3. At the time of survey, a total of 14 discharges from active mines were inventoried in the Blacklick Creek drainage area. The acid load from these sources was 134,449 lb/day, or nearly one-half of the total acid load discharged by all 161 sources. However, the contribution from active mines has been significantly reduced by the installation of treatment facilities at the active mine sites.

4. Drift mines and mine refuse piles were the major sources of abandoned mine drainage discharge in the Blacklick Creek watershed. These two source types contributed an acid load exceeding 54 tons per day. Disregarding the acid load from active sources, this 54 tons per day acid load represented nearly 80 percent of the acid load discharged by all abandoned sources.

5. A total of 18 principal sources of mine drainage discharge were located in the study area. These sources include seven drift mines, four combination mines, four mine refuse piles, two strip mines, and one shaft mine. These sources discharged a total net acid load of 125,120 lb/day. This represents about 90 percent of the acid load contributed by abandoned mines in the study area.

## DESCRIPTION OF AREA

The North Branch of Blacklick Creek rises near the community of Carrolltown and flows southwest toward the confluence with South Branch Blacklick Creek near Vintondale. The North Branch drains a 70 square mile area of Indiana and Cambria Counties.

South Branch Blacklick Creek rises above the community of Revloc. The stream is U-shaped and drains an area of 48 square miles in Cambria County. The communities of Revloc, Nanty Glo, Twin Rocks, and Vintondale are located along the main stem of the South Branch.

Blacklick Creek is formed by the confluence of the North and South Branches of Blacklick Creek near Vintondale. From this point the stream flows generally west some 32 miles to the confluence with the Conemaugh River near Blairsville. Between the communities of Vintondale and Blairsville, Blacklick drains an area of 104 square miles. This includes the drainage area of all minor tributaries but does not include Two Lick Creek. This major drainage area is included in a separate sub-basin report.

## STREAM WATER QUALITY

At the time of the mine drainage source investigation, the main stem of North Branch Blacklick Creek was affected by mine drainage below the confluence of Dutch Run. The portions of the drainage area above Dutch Run were not affected by coal mine discharges. Several portals and airways to underground mines were located, however, these sites did not contribute any discharge. The area of the North Branch most serisouly affected by mine drainage was that portion of the main stem below the confluence of Elk Creek. Elk Creek and tributaries to Elk Creek were grossly polluted by large pump discharges from active underground mines.

South Branch Blacklick Creek was unaffected by mine drainage above the community of Revloc. Below this area the stream was totally degraded by a series of pump discharges from active underground mines. Abandoned mines in this area also contributed drainage to South Branch Blacklick Creek.

Downstream of Vintondale, Blacklick Creek received major acid discharges from both active and abandoned coal mines. The distribution and magnitude of the discharges were such that the entire length of Blacklick Creek was totally degraded by mine drainage. There was no point along the main stem where the water quality of Blacklick Creek was improved by alkaline tributary inflow or by dilution and neutralization of the upstream discharges.

During the courseof the 1968 field study several stream locations

## TABLE 18

### Stream water quality sampling stations
### Blacklick Creek

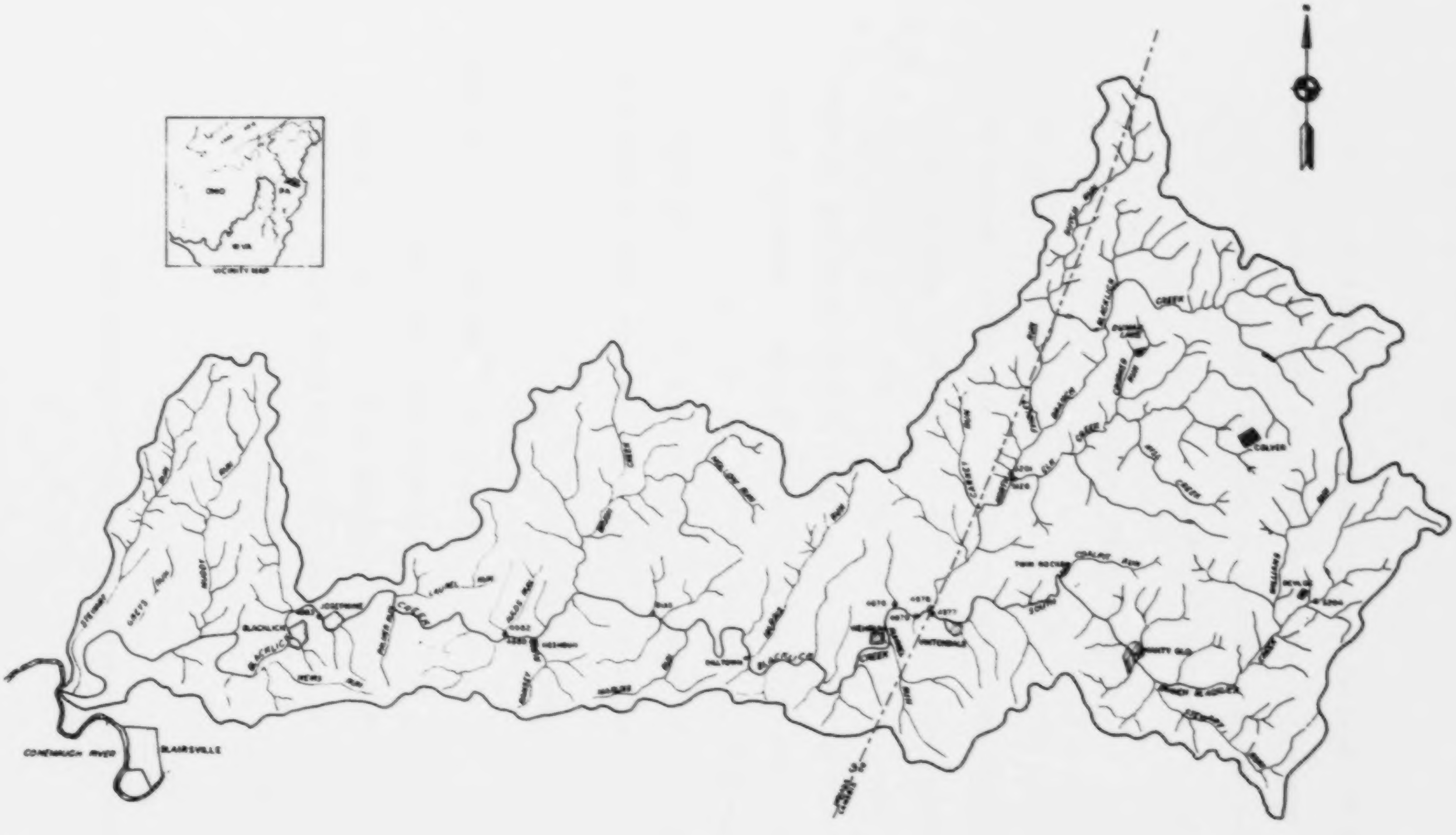
| Station No. | Sampling Periods | Stream | Location |
|---|---|---|---|
| 4983 | June, Oct, 1968 | Blacklick Creek | USGS gage @ Josephine |
| 4979 | June, Oct, 1968 | Blacklick Creek | Below confluence of North Branch and South Branch |
| 4977 | June, Oct, 1968 | South Branch Blacklick Creek | Near mouth |
| 4978 | June, Oct, 1968 | North Branch Blacklick Creek | Near mouth |
| 5201 | June, Oct, Nov, 1968 | North Branch Blacklick Creek | Above mouth of Elk Cr. |
| 5121 | June, Oct, Nov, 1968 | Elk Creek | Near Mouth |
| 5204 | July, Nov, 1968 | South Branch Blacklick Creek | At Rt. 422 |
| 4982 | June, Oct, 1968 | Aulds Run | Near mouth |
| 4980 | June, Oct, 1968 | Ramsey Run | Near mouth |
| 4976 | June, Oct, Nov, 1968 | Unnamed trib to Blacklick Creek | Near mouth |

TABLE 19

Stream water quality data

Blacklick Creek

| Station Number | Sampling Date | Flow (gpm) | pH | Specific Conductance | Total Acidity | | Hardness | | Sulfate | | Total Iron | | Manganese | | Aluminum | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day |
| 4983 | June 12, 1968 | 108,000 | 2.8 | 1,400 | 430 | 557,280 | 127 | 164,592 | 600 | 777,600 | 38.0 | 49,248 | 2.3 | 2,981 | 21.5 | 27,864 |
| " | June 26, 1968 | 40,500 | 2.9 | 2,000 | 615 | 298,890 | 190 | 92,340 | 900 | 437,400 | 56.5 | 27,459 | 3.5 | 1,701 | 36.9 | 17,933 |
| " | Oct. 16, 1968 | 14,850 | 2.6 | 2,600 | 800 | 142,560 | 236 | 42,055 | 1,230 | 219,186 | 85.4 | 15,218 | 5.3 | 944 | 35.5 | 6,326 |
| 4979 | June 11, 1968 | 48,300 | 2.8 | 1,500 | 535 | 310,086 | 117 | 67,813 | 860 | 498,456 | 97.5 | 56,511 | 2.4 | 1,391 | 27.0 | 15,649 |
| " | June 26, 1968 | 36,250 | 2.8 | 2,275 | 830 | 361,050 | 220 | 95,700 | 1,275 | 554,625 | 116.5 | 50,678 | 3.9 | 1,997 | 50.7 | 22,055 |
| " | Oct. 17, 1968 | 13,028 | 2.9 | 2,650 | 880 | 137,576 | 272 | 42,523 | 1,470 | 229,814 | 117.3 | 18,338 | 14.9 | 2,329 | 26.0 | 4,065 |
| 4977 | June 11, 1968 | 41,500 | 3.3 | 1,300 | 329 | 163,842 | 182 | 90,636 | 690 | 343,620 | 15.3 | 7,619 | 1.9 | 946 | 19.3 | 9,611 |
| " | June 26, 1968 | 19,044 | 2.8 | 1,875 | 505 | 115,407 | 220 | 50,276 | 860 | 196,534 | 55.0 | 12,569 | 2.7 | 617 | 34.3 | 7,839 |
| " | Oct. 17, 1968 | 9,000 | 2.9 | 2,600 | 145 | 15,660 | 307 | 33,156 | 1,290 | 139,320 | 65.7 | 7,096 | 4.0 | 432 | 32.6 | 3,521 |
| 4978 | June 11, 1968 | 32,250 | 2.8 | 1,600 | 575 | 222,525 | 133 | 51,471 | 920 | 356,040 | 90.0 | 34,830 | 2.6 | 1,006 | 31.2 | 12,074 |
| " | June 26, 1968 | 15,601 | 2.5 | 2,300 | 850 | 159,130 | 244 | 45,680 | 1,275 | 238,695 | 139.4 | 26,097 | 4.0 | 749 | 54.0 | 10,109 |
| " | Oct. 17, 1968 | 5,028 | 2.6 | 2,700 | 1071 | 64,620 | 79 | 4,767 | 1,540 | 92,917 | 153.7 | 9,274 | 5.8 | 350 | 40.0 | 2,413 |
| 5201 | June 27, 1968 | 1,850 | 5.1 | 640 | 14 | 311 | 124 | 2,753 | 310 | 6,882 | 2.0 | 44 | 1.0 | 22 | 0.7 | 16 |
| " | Oct. 15, 1968 | 200 | 6.6 | 680 | 210 | 504 | 62 | 149 | 200 | 480 | 20.0 | 48 | 10.4 | 25 | 5.1 | 12 |
| " | Nov. 13, 1968 | 2,318 | 7.1 | 605 | 14 | 389 | 68 | 1,891 | 165 | 4,590 | 0.6 | 17 | 0.0 | 0 | 1.1 | 31 |
| 5126 | June 27, 1968 | 9,500 | 2.8 | 2,400 | 1125 | 128,250 | 265 | 30,210 | 1,920 | 218,880 | 307.5 | 35,055 | 5.3 | 604 | 77.8 | 8,869 |
| " | Oct. 15, 1968 | 3,220 | 2.8 | 3,000 | 1300 | 50,232 | 188 | 7,264 | 1,960 | 75,734 | 282.6 | 10,920 | 6.9 | 267 | 56.7 | 2,191 |
| " | Nov. 13, 1968 | 3,513 | 5.4 | 2,600 | 1295 | 54,592 | 511 | 21,542 | 1,620 | 68,293 | 325.0 | 13,701 | 4.8 | 202 | 75.9 | 3,200 |
| 5204 | July 01, 1968 | 645 | 5.8 | 120 | 5 | 39 | 37 | 286 | 15 | 116 | 2.5 | 19 | 4.4 | 34 | 0.9 | 7 |
| " | Nov. 14, 1968 | 200 | 7.5 | 190 | 20 | 48 | 37 | 89 | 20 | 48 | 3.4 | 8 | 0.7 | 2 | 2.2 | 5 |
| 4982 | June 12, 1968 | 860 | 2.9 | 2,050 | 1200 | 12,384 | 455 | 4,696 | 1,450 | 14,964 | 287.5 | 2,967 | 6.6 | 68 | 53.0 | 547 |
| " | June 26, 1968 | 425 | 2.8 | 2,500 | 1390 | 7,089 | 225 | 1,148 | 1,680 | 8,568 | 302.5 | 1,543 | 8.8 | 45 | 82.7 | 422 |
| " | Oct. 16, 1968 | 360 | 2.7 | 3,000 | 1980 | 8,554 | 316 | 1,365 | 2,170 | 9,374 | 338.4 | 1,462 | 14.5 | 63 | 72.2 | 312 |
| 4980 | June 11, 1968 | 1,300 | 2.7 | 1,300 | 500 | 7,980 | 81 | 1,293 | 555 | 8,858 | 53.5 | 854 | 2.6 | 41 | 31.2 | 498 |
| " | June 26, 1968 | 178 | 2.9 | 1,400 | 645 | 1,378 | 63 | 135 | 600 | 1,282 | 77.0 | 164 | 5.2 | 11 | 49.9 | 107 |
| " | Oct. 16, 1968 | 55 | 2.6 | 2,400 | 1700 | 1,122 | 228 | 150 | 1,680 | 1,109 | 22.6 | 15 | 22.6 | 15 | 108.7 | 72 |
| 4976 | June 11, 1968 | 382 | 3.0 | 465 | 139 | 637 | 45 | 206 | 120 | 550 | 14.9 | 68 | 0.1 | 5 | 3.5 | 16 |
| " | Oct. 15, 1968 | 70 | 3.5 | 420 | 325 | 273 | 22 | 18 | 125 | 105 | 29.9 | 25 | 0.1 | 0 | 5.5 | 5 |
| " | Nov. 13, 1968 | 225 | 3.3 | 380 | 81 | 219 | 44 | 119 | 80 | 216 | 24.4 | 66 | 0.0 | 0 | 3.0 | 8 |


VICINITY MAP
OHIO
PA.
W.VA.
CONEMAUGH RIVER
BLAIRSVILLE
BLACKLICK
JOSEPHINE
LAUREL RUN
CREEK
HOLLOW RUN
DILLTOWN
BLACKLICK
CREEK
VINTONDALE
TWIN ROCKS
COALPIT RUN
SOUTH
NANTY GLO
NORTH BRANCH
BLACKLICK
CREEK
ELK
CREEK
BRANCH
COLVER
WILLIAMS
BEULAH
STEWART
RUN
4070
4076
4077

LEGEND

● STREAM WATER QUALITY SAMPLING LOCATIONS

12

BLACKLIC

STREAM WATER QUALITY SAMPLING LOCATIONS

were sampled for chemical analysis (Table 18). These stations were selected to measure the cumulative effects of mine drainage. A summary of this stream data is presented in Table 19. The locations of the sampling points are shown in Figure 12.

## SOURCES OF MINE DRAINAGE

An estimated 275 mining sites and approximately 1,675 acres of surface mined area were investigated during this study. Samples for chemical analysis were collected from 161 sources discharging at the time of the survey. The total effluent from these sources was more than 25 thousand gallons per minute (gpm) or over 36 million gallons per day (mgd). The total net acid load discharged to Blacklick Creek (excluding Two Lick Creek) was over 136 tons per day.

A description of the mine drainage sources follows. All mine site locations in the Blacklick Creek study area are shown in Figure 13.

## NORTH BRANCH BLACKLICK CREEK

All of the mine discharges located on this tributary resulted from active underground mines. These effluents were discharged to Elk Creek, Dutch Run, and tributaries to Elk Creek. A surface mine was in operation along the very headwaters of the North Branch, however, the mine was dry.

### Elk Creek

The Colver Mine, operated by Eastern Associated Coal Corporation, is located near the headwaters of Elk Creek. At the time of survey the Colver Mine discharged an untreated effluent of 3,222 gpm (No. 5125). The acid load carried by this discharge approached 10 tons per day. The Colver Mine has installed treatment facilities since the 1968 survey. According to recent (1971) information supplied by the Pennsylvania Department of Environmental Resources this treatment results in a final effluent exhibiting a net alkalinity. However, at this time the iron concentration often exceeds the permissible maximum and additional upgrading of the facility will be required. The present discharge point is now located approximately one mile west of the original bore hole discharge point No. 5125. An acid effluent was also collected at the base of the large refuse dump associated with the Colver Mine (No. 4724).

A second major active mine effluent was discharged to Crooked Run, a tributary to Elk Creek. This effluent (No. 5012) is located at Duman Lake Park and results from the Lancashire Mines of Barnes and Tucker Coal Company. At the time of sampling the effluent was 3,800 gpm and carried an acid load of more than 22 tons per day. For a period of time this effluent discharged to the Susquehanna River drainage after a breakthrough near the community of Barnesboro. This diversion of discharge required a massive in-stream neautralization effort by Pennsylvania in order to minimize the deleterious water quality effects upon the West Branch Susquehanna River. At the present time the effluent has been eliminated from the Susquehanna drainage and again discharges to Crooked Creek from the Duman Lake Park bore holes. Treatment facilities are presently in operation at the Duman Lake site.

## Dutch Run

Two additional borehole discharges from the Barnes and Tucker Mines were located on Dutch Run. No. 5010 was located approximately one mile northwest of Duman Lake and No. 5011 was located near Stiles Crossing. The present location of these borehole discharges may differ from those originally found. However, according to the Pennsylvania Department of Environmental Resources, these remaining Barnes and Tucker discharges are treated and comply with the required effluent standards.

Sampling was conducted at several stream locations on North Branch Blacklick Creek coincident with the mine inventory. These sample points were located near the mouth of North Branch (No. 4978), near the mouth of Elk Creek (No. 5121), and on the North Branch above Elk Creek (No. 5201). This water quality data is shown in Table 18.

# SOUTH BRANCH BLACKLICK CREEK

## Revloc Area

The South Branch of Blacklick Creek was unaffected by mine drainage above the community of Revloc. The only indication of a mine operation in this area was an operating air fan for an underground mine. The pH of the stream above Revloc remained above 7.4 and the conductivity was less than 150 micromhos/cm.

Mine refuse dumps associated with the Revloc No. 32 mine in the community of Revloc contributed significant amounts of highly mineralized drainage to the South Branch. These two dumps covered approximately 38 acres and contributed an acid load of 1,057 lb/day to the South Branch. Four samples were collected and each represent cumulative seepage around the perimeter of the refuse areas. (No.'s 4543, 4544, 4545, 4546). The pH of the South Branch was 4.0 below the mine dumps.

The experimental treatment facility of the Bethlehem Mines Corporation was located approximately one mile below (downstream) of Revloc. At this point the drainage from the Revloc No. 32 Mine and the Cambria Slope No. 33 Mine was pumped to the surface via bordhole. At the time of inspection this experimental facility was treating 1,200 gpm by use of lime neutralization. An additional effluent of approximately 2,000 gpm was by-passing the treatment facility and discharged to the South Branch. At the time of sampling (1968) the treated effluent was alkaline (778 lb/day, No. 5188) while the untreated portion of the effluent carried an acid load of more than 6.5 tons per day (No. 5187).

The Pennsylvania Department of Environmental Resources reports (1971) that this facility has been expanded to a full scale treatment plant and now provides treatment for the entire discharge from the No. 32 and No. 33 Mines. The alkaline effluent from this plant may exceed as much as 6 mgd.

The Cambria No. 33 Slope Mine is located outside the Blacklick Creek drainage area on a tributary to the Little Conemaugh River.

However, the entire effluent from this mine is pumped to the facility below Revloc for treatment.

## Nanty Glo area

The next downstream source of mine drainage discharge on the South Branch was located near the community of Nanty Glo. The Bethlehem Mines Corporation Nanty Glo Mine No. 31 is located in this community. The discharge from this mine is via borehole approximately one mile from the mine. At the time of inspection, a discharge of 2,700 gpm was measured at this site. The acid load discharged to the South Branch was more than 18 tons per day (No. 5189). The iron load from this discharge exceeded four tons per day. The Pennsylvania Department of Environmental Resources reports (1971) that facilities are now under construction for treatment of this effluent.

There are two mine refuse dumps associated with the Nanty Glo No. 31 Mine. These two dumps cover an area of approximately 64 acres. Both mine dumps are located along a small unnamed tributary of the South Branch. Considerable seepage was present at the base of the piles and the cumulative result of this seepage was the complete water quality degradation of the tributary. Below the southernmost pile, the stream carried an acid load exceeding 17.5 tons per day (No. 5037). Seepage points from the other pile contributed an additional acid load of 2,644 lb/day to the unnamed tributary as well as a 1,015 lb/day load directly to the South Branch (No.'s 5039 and 5040).

Two small discharging abandoned drift mines were located in the Nanty Glo area (Mine No.'s 5035 and 5043); however, these mines contributed only negligible acid loads.

Mine No. 4795 was the only site discharging a significant acid load to the South Branch between Nanty Glo and the downstream community of Twin Rocks. At Mine No. 4795 a total effluent of 100 gpm emanated from three caved drift openings. The acid load carried by this effluent was 186 lb/day.

### Twin Rocks area

A large refuse pile and several drift mine openings were located adjacent to the South Branch immediately south of Twin Rocks. At the time of inspection, there was no drainage from the mine openings or from the refuse area. Several drift mine openings and two surface mines were located on Coalpit Run, a tributary which joins the South Branch in Twin Rocks. Mine No. 5079 discharged an acid load of 227 lb/day to the headwaters of Coalpit Run. An additional load of 311 lb/day was discharged to the tributary by the refuse pile (No. 5080) associated with this drift mine. Downstream of these discharges, an abandoned surface mine (No. 5082) contributed an acid load of 159 lb/day.

The Twin Rocks Mine of the Johnstown Coal and Coke Company was located near the lower reach of Coalpit Run. At the time of sampling, this active mine (No. 5009) had an alkaline discharge.

It has been reported that this mine is now sealed and abandoned.

Vintondale area

A series of drift openings and several surface mines were located along both banks of the South Branch in the vicinity of Vintondale. Mine No. 4542 was the only active operation. This mine was operated by the Vinton Coal Company. An acid load of 1,827 lb/day was discharged by this mine. However, according to the Pennsylvania Department of Environmental Resources, the operators are not responsible for the acid discharge and, therefore, not required to supply treatment.

Stream sampling conducted coincident with the mine drainage survey showed that South Branch Blacklick Creek near the mouth carried an acid load ranging from 7.5 tons per day (low flow conditions) to 82 tons per day (high flow conditions).

## BLACKLICK CREEK, BELOW VINTONDALE

A large refuse pile is located adjacent to Blacklick Creek approximately 0.3 mile below the confluence of the North and South Branches of Blacklick Creek at Vintondale. Two open shaft entries and one sealed slope entry were located within the refuse area. It was reported that this mine closed in 1929. Two small hillside springs and one small unnamed tributary are directed across this large refuse dump before entering Blacklick Creek.

As a result, these drainages are affected by the waste material. These sources (No.'s 4743, 4744, and 4745) carried a combined acid load of 962 lb/day at the points where they entered Blacklick Creek. A much larger tributary is also diverted through the refuse dump near the downstream limit of the refuse pile. The acid load measured near the mouth of this tributary ranged from 219 lb/day to 637 lb/day (No. 4976, Table 19).

Two additional open shaft entries, reportedly interconnected with the openings mentioned above, were found in the abandoned mining community of Wehrum. A sixth opening, also reported as interconnected, is located approximately 0.6 mile downstream of Wehrum. At this site, a 1,020 gpm artesian effluent was discharged to Ramsey Run, a direct tributary of Blacklick Creek. This shaft (Mine No. 4746) contributed an acid load in excess of 5.5 tons per day to the receiving stream.

## Rummel Run

A total of four surface mines and 14 drift mine openings were located within the Rummel Run drainage area. Mine No. 4851 was a small active drift mine operated by the D. & J. Coal Co. A negligible acid load was discharged by the mine. The operator is not responsible for the discharge and the Department of Environmental Resources does not require treatment of the discharge.

The major portion of the mine drainage discharged to Rummel Run resulted from an area which has been mined by both surface and underground methods. A total of four effluents were located at this site (No. 4853, 4854, 4855, 4856). The combined acid load from this complex was 718 lb/day.

## Mardis Run

Five surface mines and two abandoned drift mines were located within the Mardis Run drainage area. All of these operations were dry.

## Blacklick Creek, Dilltown to Dias - Southbank

This area has been extensively mined by both surface and underground mining methods. The majority of the mines are located adjacent to the main stem of Blacklick Creek.

Two caved mine openings were located along the south bank of Blacklick Creek west of Dilltown. Mine No. 4857 contributed an acid discharge of 1,138 lb/day and Mine No. 4858 discharged a load of nearly 19 tons per day. The original opening at Mine No. 4858 has been sealed; however, the 960 gpm effluent has broken through the hillside adjacent to the seal. This drainage cascades over a 20 foot embankment into Blacklick Creek.

One abandoned mine discharge and two refuse pile discharges were located along the south bank of this portion of Blacklick Creek.

Mine No. 4859 discharged to Mardis Run. The discharge is artesian and probably results from a point of breakthrough from one of the nearby underground mines. The acid load was 1,141 lb/day. The two refuse pile discharges (No.'s 4860, 4861) contributed an additional acid load of 150 lb/day.

Two active underground mine operations were located along this section of Blacklick Creek. They were the Dias Mine of the Armaugh Coal Company and the Blacklick Mine of the Florence Mining Company. Neither mine was discharging at the time of inspection. It has been reported that these mines are now interconnected with other Florence Mining Company operations located along the Conemaugh River near the new Conemaugh River power plant.

### Blacklick Creek, Dilltown to Dias - Northbank

Mine No. 4748 contributed an effluent of 60 gpm to a small unnamed tributary of Blacklick Creek just below Dilltown. There were actually two openings at this site. One was caved and dry while the second opening discharged the 60 gpm effluent. The acid load was 418 lb/day.

A total of five discharge points were recorded along a 1.5 mile contour surface mine located adjacent to Mine No. 4748. Several drift mine openings were located within this surface mined area. The five discharge points resulted from old mine openings as well as from surface impoundments adjacent to the highwall. The combined acid load from these sources (No.'s 4870, 4871, 4872, 4873, and 4874) was 395 lb/day.

There were five additional surface mines downstream of the area described above. Several minor acid discharges were recorded from cumulative seepage which occurred at the base of the spoil piles. Four major sources of acid discharge were also associated with these surface mines. These were Mine No.'s 4863, 4866, 4868 and 4869. The combined acid load was 6,651 lb/day.

An underground mine was under development near the headwaters of the unnamed tributary on which the mines described above are located. This mine had not begun production at the time of inspection. This mine is now operated by the Oneida Mining Company and produces an alkaline discharge.

## Blacklick Creek, Dias to Heshbon - Southbank

Eleven drift mine openings and three surface mines were located along the south bank of Blacklick Creek in the Dias to Heshbon area. Only four of these mines were discharging and the acid loads were minor. The only major source of mine drainage pollution (No. 5571) was contributed by drainage from an abandoned mine refuse dump located on Ramsey Run. The 12 gpm effluent from the mine dump area carried an acid load of 4,709 lb/day. The acidity concentration of this highly mineralized effluent was 32,700 mg/l.

Stream sampling was conducted at the mouth of Ramsey Run coincident with source investigation. At this time Ramsey Run discharged an acid load ranging from 1,122 lb/day to 7,980 lb/day to Blacklick Creek (Table 19).

## Blacklick Creek, Dias to Heshbon - Northbank

An active coal preparation plant was located on the north bank of Blacklick Creek immediately west of Route 56 at Dias. This facility served the numerous active mine operations in the surrounding area. An abandoned surface mine is located on the hillside immediately above the preparation plant. Almost the entire area of the surface mine has been filled with waste material from the plant. Water discharged by the surface mine, possibly from underground origin, passes around and through the somewhat compacted material. The acid loads carried by these effluents (No.'s 4878 and 4879) were 115 lb/day and 648 lb/day, respectively.

Mine No. 4889 contributed the only remaining significant acid discharge in the Dias to Heshbon area. The two caved openings to this mine are located on the bank of Blacklick Creek east of Heshbon. The measured effluent was 40 gpm which carried an acid load of 360 lb/day.

## Blacklick Creek, Heshbon to Josephine - Southbank

This portion of the Blacklick Creek drainage area has been extensively mined by both surface and underground mining methods. Surface mines have disturbed several hundred acres and many of these sites are associated with drift mines. Forty-four of the mines had measurable discharges at the time of the inventory. However, only Mine No.'s 4836, 5018 and 5026 contributed significant acid discharges.

Mine No. 4836 is located near the headwaters of a small unnamed tributary of Blacklick Creek. At the time of survey, the 85 gpm effluent from this mine represented the entire flow of the tributary. The acid load was 541 lb/day.

A 250 gpm effluent was measured at the base of the slumped drift opening at Mine No. 5018. This opening is one of several situated along both banks of the small receiving tributary. The acid load was 1,170 lb/day.

Mine No. 5026 discharged an acid load of 3,467 lb/day to an unnamed tributary. There are four other drift mine openings in the immediate area, all of which contributed additional acid discharges.

## Blacklick Creek, Heshbon to Josephine-Northbank

The major mining activity in this area is centered around Aulds Run, a tributary to Blacklick Creek. The largest acid load found in this area was discharged by the abandoned L.C.S. Collieries Virginia No. 14 Mine. The effluent was 405 gpm which carried an acid load of nearly 5 tons per day (Mine No. 4890). An acitve drift mine operated by the Sunny Creek Coal Company was located along the west side of Aulds Run. The 40 gpm effluent from this operation underwent lime neutralization and settlement prior to discharge to Aulds Run. At the time of sampling the Sunny Creek Mine (No. 4895) discharged a negligable acid load.

Stream sampling was conducted at the mouth of Aulds Run coincident with the source investigation. At this time Aulds Run discharged an acid load ranging from 3.5 tons per day to 6.2 tons per day to Blacklick Creek (Table 19).

A coal preparation plant is located along the north bank of Blacklick Creek near the mouth of Aulds Run. Waste material from this plant is trucked to the unreclaimed strip mine cuts on the hillside overlooking Blacklick Creek. These surface mines have also intersected underground workings from the Virginia No. 14 Mine mentioned above. Drainage from the underground workings and/or the surface mines percolate through the waste material deposited in the pits. Highly mineralized seepage areas occurred in many areas even after the previously unreclaimed strip mine spoil piles were backfilled over the pyritic materials. As a result, it is quite difficult to determine the original origin of some of the effluents sampled during the study. The largest of these discharges was No. 4898 which carried an acid load of 5,220 lb/day. Another three gpm effluent from a refuse filled strip pit had an acidity concentration of 61,250 mg/l with an acid load of 2,205 lb/day (No. 4897).

Mine No. 4922 discharged an acid load of 719 lb/day to Laurel Run, a tributary to Blacklick Creek downstream of Aulds Run. This sealed mine is located at the headwaters of the tributary. Surface and underground mine openings were located along both banks of Laurel Run immediately below Mine No. 4922. However, these mines contributed only minor acid loads. The largest acid load in the Laurel Run drainage area resulted from a borehole discharge of the Virginia No. 20 Mine operated by Crichton Coal and Coke. A 1,710 gpm effluent from this mine discharged an acid load of 2,565 lb/day to Laurel Run. This mine is presently reported as inactive. The status of the discharge is unknown.

Laurel Run received two additional mine drainage discharges from a large surface mined area on the north bank of the tributary. These were discharge No.'s 5015 and 5016 with acid loads of 194 lb/day and 961 lb/day, respectively.

The active Josephine Mine of the Willowbrook Coal Company was the last downstream operation in the area of north bank Blacklick Creek from Heshbon to Josephine. During the survey period, the 450 gpm effluent from the Josephine Mine received inadequate treatment. The acid load at this time was 1,863 lb/day (Mine No. 5152). Upgraded treatment facilities have been installed but the present status of the effluent is unknown.

## Blacklick Creek, Josephine to Mouth - South Bank

The last area of mining activity on the south side of Blacklick Creek occurred along several unnamed tributaries northwest of the junction of Routes 22 and 119. A total of 14 discharging mine sites were located in this small area. The total source acid load was more than 2,500 lb/day. The 65 gpm effluent from Mine No. 4910 discharged 1,447 lb/day of the 2,500 lb/day total load.

## Blacklick Creek, Josephine to Mouth - North Bank

Coal mining operations on the north side of Blacklick Creek were confined to Muddy Run and an unnamed tributary adjacent to Muddy Run. A total of 14 drift mine openings were found in these two areas. Five of these were discharging at the time of inspection. The combined acid load was 262 lb/day. Mine No. 4273 discharged 118 lb/day of this 262 lb/day total source acid load.

## Active Mines

During the course of the field inventory, a total of 14 discharges from active mines were sampled in the Blacklick Creek drainage area. Updated information (1971), supplied by the Pennsylvania Department of Environmental Resources, indicated that treatment facilities are presently in operation at all but one active discharge site in the watershed. The one exception is the Bethlehem Mines Corporation Nanty Glo No. 31 Mine. However, treatment facilities are under construction at this time.

Two discharges were associated with the Virginia No. 20 Mine operated by Crichton Coal and Coke. These were discharge No.'s 4541 and 4981. Nearly the entire 2,573 lb/day acid load was contributed by No. 4981. This mine is reportedly closed and the present status of the discharges is unknown.

Mine No. 5009 operated by the Johnstown Coal and Coke Company has closed since the date of inventory. The mine is now abandoned and sealed.

Mine No. 4542 is a drift mine operated by the Vinton Coal Company. This mine discharged an acid load of 1,827 lb/day at the time of survey. However, the Pennsylvania Department of Environmental Resources reports that this mine operates in previously abandoned workings and, provided no increase in pollutional load occurs, is not required to supply treatment. Mine No. 4831 is also exempted from supplying treatment. The acid load from this mine at the time of survey was negligible (5lb/day).

A total of 161 discharging sources and approximately 1,675 acres of surface mined area were investigated during this study. Table 20 presents an area breakdown in terms of total flow and total loading (lb/day) of polluting constituents discharged to receiving streams in the Blacklick Creek study area. Table 21 presents a summary of flow volumes and chemical loading by source type for the 161 discharging sources inventoried during the study.

## TABLE 20

### Mine drainage loadings by receiving stream
### Blacklick Creek watershed

| Receiving Stream | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminu (lb/day |
|---|---|---|---|---|---|---|---|---|
| Blacklick Creek | 25 | 2,015 | 45,627 | 10,081 | 62,893 | 5,273 | 165 | 452 |
| Unnamed tribs to Blacklick Creek | 57 | 2,578 | 16,038 | 4,197 | 20,753 | 1,633 | 104 | 648 |
| Unnamed tribs to Muddy Run | 4 | 70 | 247 | 335 | 628 | 4 | 4 | 12 |
| Weirs Run | 6 | 232 | 217 | 263 | 560 | 3 | 4 | 10 |
| Laurel Run | 7 | 376 | 786 | 500 | 1,187 | 92 | 5 | 47 |
| Unnamed tribs to Laurel Run | 4 | 1,789 | 2,863 | 12,323 | 22,675 | 324 | 55 | 110 |
| Ramsey Run | 2 | 1,032 | 16,031 | 3,212 | 16,204 | 3,168 | 65 | 790 |
| Unnamed tribs to Ramsey Run | 1 | 2 | 5 | 1 | 2 | 0 | 0 | 0 |
| Marldis Run | 2 | 63 | 1,221 | 238 | 1,247 | 222 | 5 | 29 |
| Aulds Run | 2 | 429 | 10,478 | 1,915 | 11,741 | 4,269 | 39 | 540 |
| Unnamed tribs to Aulds Run | 6 | 106 | 6,934 | 399 | 6,728 | 2,672 | 15 | 388 |
| Unnamed tribs to Rummel Run | 7 | 94 | 733 | 105 | 825 | 40 | 6 | 33 |
| South Branch Blacklick Cr. | 7 | 3,438 | 15,426 | 20,029 | 50,964 | 4,114 | 125 | 682 |
| Unnamed tribs to South Branch Blacklick Cr. | 21 | 3,695 | 76,637 | 20,321 | 99,226 | 11,036 | 241 | 5,299 |
| Brush Creek | 1 | 33 | 90 | 29 | 79 | 4 | 0 | 3 |
| Coal Pit Run | 4 | 158 | 687 | 305 | 914 | 40 | 4 | 37 |
| Elk Creek | 1 | 2 | 141 | 5 | 149 | 13 | 2 | 14 |
| Crooked Run | 1 | 3,800 | 44,682 | 9,211 | 76,608 | 13,511 | 269 | 1,646 |
| Dutch Run | 2 | 2,062 | 14,511 | 6,802 | 21,284 | 3,153 | 224 | 982 |
| Unnamed tribs to Hill Creek | 1 | 3,222 | 19,719 | 21,845 | 78,101 | 8,603 | 193 | 2,076 |
| TOTALS | 161 | 25,196 | 273,073 | 112,616 | 472,768 | 58,174 | 1,525 | 13,798 |

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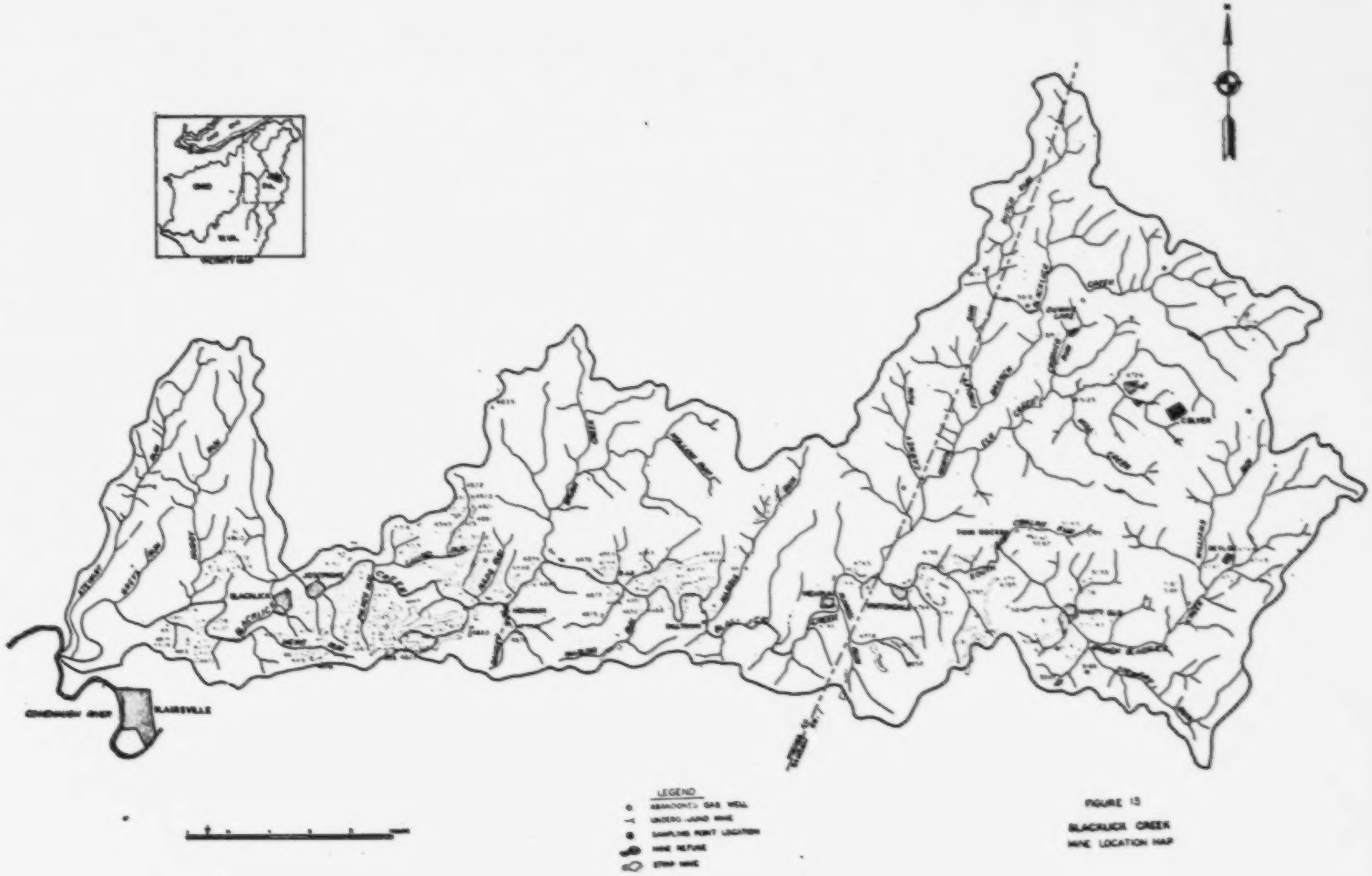
BLAIRSVILLE
CONEMAUGH RIVER
BLACKLICK
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE

FIGURE 13

BLACKLICK CREEK
MINE LOCATION MAP

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## TABLE 21

Mine drainage loadings by source type
Blacklick Creek watershed

| Source Type | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Drift Mines (abandoned) | 54 | 3,710 | 61,246 | 13,205 | 82,345 | 9,457 | 253 | 1,190 |
| Drift Mines (active) | 5 | 731 | 3,702 | 2,739 | 6,347 | 225 | 22 | 173 |
| Strip Mines (abandoned) | 42 | 1,132 | 5,448 | 2,036 | 6,719 | 1,426 | 39 | 312 |
| Combination Mines (abandoned) | 27 | 1,053 | 13,501 | 1,773 | 13,746 | 2,961 | 57 | 599 |
| Shaft Mines (abandoned) | 2 | 1,022 | 11,326 | 3,135 | 12,431 | 1,643 | 60 | 664 |
| Shaft Mines (active) | 9 | 16,696 | 130,747 | 80,761 | 305,980 | 38,117 | 973 | 6,808 |
| Refuse Piles (abandoned) | 22 | 852 | 47,103 | 8,967 | 45,200 | 4,345 | 121 | 4,052 |
| TOTALS * | 161 | 25,196 | 273,073 | 112,616 | 472,768 | 58,174 | 1,525 | 13,798 |

* Parameter loadings reflect conditions measured during the 1968 survey, The active mine contribution has been significantly reduced since this date due to the installation of treatment facilities.

## POLLUTION ABATEMENT

As shown in Table 21, active shaft mines were the principal pollution sources within the Blacklick Creek drainage area. The 273,073 lb/day acid load shown in the table reflects the mine drainage conditions found during the 1968 survey. The contribution from active shaft or slope mines represents nearly one half of the total source acid load measured at all 161 mine discharge points (Table 21).

A more realistic estimation of the mine drainage problem in the Blacklick Creek area may be obtained by deleting the contribution from all active sources (shaft or slope mines and drift mines). The contribution from active mines has been significantly reduced by the installation of treatment facilities at many of the mines. Completion of treatment facilities at any mine not presently providing treatment, coupled with adequate state regulatory control should reduce to a minimum the unabated mine drainage contribution from active sites in the Blacklick Creek watershed.

For discussion purposes only the total source acid load from abandoned mine sites will be considered. The abandoned source acid load at the time of survey was 138,624 lb/day (Table 21, total source acid load less active acid load).

Based on the initial field survey sampling program, 18 of the total 161 discharging sites contributed about 90 percent of the total acid load from abandoned mines measured in the study area. These sources included seven drift mines, four refuse pile areas, three strip mines, two combination surface-underground mines, and one shaft mine. The combined acid load discharged by these 18 sites was 125,120 lb/day.

Any initial consideration of a mine drainage abatement program in Blacklick Creek should include the 18 sources mentioned above. Irrespective of hydrologic conditions, these sites would be expected to contribute significant acid discharges. Detailed engineering studies and mine effluent sampling conducted during an entire water year would more accurately characterize the relative contribution of each source. Due to the magnitude of each discharge, it would be expected that even when considered over a longer time period, each site would remain a major contributor. However, long term repetitive water quality determinations may necessitate the consideration of additional sources located elsewhere in the basin.

The 18 principal sources (listed in Table 22) located during this initial survey provide a relative indication as to where the major mine drainage problems occur in the Blacklick Creek watershed. Until such a time when additional study can provide a more detailed assessment of the problem, these 18 sources can effectively serve as the first phase or priority in a program of drainage source abatement in the Blacklick Creek watershed. Once drainage control has been established at the principal source sites, the abatement program could be expanded to include additional discharge points.

The following is a description of the 18 principal sources. A listing of these sources is shown in Table 22. The locations of these mine sites are shown in Figure 14. In the Blacklick Creek watershed, all sites which contributed an acid load exceeding 900 lb/day are considered as principal sources.

## TABLE 22

### Principal mine drainage sources
### Blacklick Creek watershed

| Mine No. | Type of Mine | Flow (gpm) | pH | Specific Conductance | Acidity mg/1 | Acidity lb/day | Receiving Stream |
|---|---|---|---|---|---|---|---|
| 4745 | Refuse pile | 135 | 3.4 | 1,600 | 560 | 907 | Blacklick Creek |
| 4746 | Shaft mine | 1020 | 3.6 | 2,800 | 925 | 11,322 | Unnamed trib to Ramsey Run |
| 4857 | Drift Mine | 80 | 4.2 | 3,000 | 1,185 | 1,138 | Blacklick Creek |
| 4858 | Drift Mine | 960 | 3.8 | 7,500 | 3,260 | 37,555 | Blacklick Creek |
| 4859 | Drift Mine | 60 | 3.4 | 4,000 | 1,585 | 1,141 | Marldis Run |
| 4866 | Combination Mine | 180 | 3.8 | 3,500 | 1,190 | 2,570 | Unnamed trib to Blacklick Cr. |
| 4868 | Drift Mine | 120 | 3.7 | 6,000 | 1,280 | 1,843 | Unnamed trib to Blacklick Cr. |
| 4869 | Combination Mine | 90 | 4.2 | 3,750 | 1,595 | 1,722 | Unnamed trib to Blacklick Cr. |
| 4890 | Drift Mine | 405 | 2.5 | 4,000 | 2,055 | 9,987 | Aulds Run |
| 4893 | Strip Mine | 5 | 2.3 | 9,800 | 20,000 | 1,200 | Unnamed trib to Aulds Run |
| 4897 | Strip Mine | 3 | 2.2 | 32,000 | 61,250 | 2,205 | Blacklick Creek |
| 4898 | Combination Mine | 15 | 2.1 | 20,500 | 29,000 | 5,220 | Unnamed trib to Aulds Run |
| 4910 | Combination Mine | 65 | 2.7 | 2,400 | 1,855 | 1,447 | Unnamed trib to Blacklick Cr. |
| 5018 | Drift Mine | 250 | 2.2 | 1,400 | 390 | 1,170 | Unnamed trib to Blacklick Cr. |
| 5026 | Drift Mine | 540 | 2.3 | 1,600 | 535 | 3,467 | Unnamed trib to Blacklick Cr. |
| 5037 | Refuse Pile | 480 | 2.7 | 8,000 | 6,150 | 35,424 | Unnamed trib to S. Branch Blacklick Cr. |
| 5076 | Refuse Pile | 8 | 1.9 | 12,800 | 21,800 | 2,093 | Unnamed trib to S. Branch Blacklick Cr. |
| 5571 | Refuse Pile | 12 | 2.6 | 15,000 | 32,700 | 4,709 | Ramsey Run |
| TOTALS |  | 4428 |  |  |  | 125,120 |  |

## PRINCIPAL SOURCES

### Site No. 4745

The origin of this acid discharge is not a mine site. At this location, a small unnamed tributary is diverted around and through an extensive mine refuse area prior to entering Blacklick Creek. In addition to the 907 lb/day acid load contributed at this site, there are similar discharges along the entire length of the refuse area which lies adjacent to Blacklick Creek.

### Mine No. 4746

The abandoned shaft mine discharge is located approximately 0.6 mile downstream of the abandoned mining community of Wehrum. The discharge point is the sixth shaft opening in a series of reportedly interconnected shaft mines along Blacklick Creek from Vintondale to the Wehrum area. All five upstream openings were dry. The discharge from Mine No. 4746 was 1,020 gpm and carried an acid load of 11,322 lb/day. Three of the five additional entries are located in the vicinity of the large refuse pile downstream of Vintondale and the remaining two entries are located in Wehrum.

### Mine No. 4857

An 80 gpm effluent was measured at the base of the slumped drift opening to Mine No. 4857. A contour surface mine is located immediately adjacent to the opening but has not intersected the face of the portal.

However, this surface mine has intersected and partially destroyed or covered several additional underground mine openings which probably interconnect with Mine No. 4857. The acid load discharged to Blacklick Creek by Mine No. 4857 was 1,138 lb/day.

## Mine No. 4858

This mine opening is located approximately 650 yards downstream of Mine No. 4857 at the same elevation along the southbank of Blacklick Creek. The original opening of Mine No. 4858 had been sealed. However, the 960 gpm effluent has broken through the hillside adjacent to the seal. The drainage cascades over a 20 foot embankment into Blacklick Creek. The acid load contributed by Mine No. 4858 was 37,555 lb/day.

## Mine No. 4859

This mine is located approximately 0.5 mile above the mouth of Mardlis Run. Contour surface mines and drift mines are situated along both banks of Marldis Run in the vicinity of the No. 4859 discharge. The effluent is artesian and probably results from a point of breakthrough from one of the ambient mines. The acid load was 1,141 lb/day.

## Mine No. 4866

Mine No. 4866 contributed an effluent of 180 gpm which carried an acid load of 2,570 lb/day. Several drift mine openings are located in the highwall of this contour surface mine. Heavy rainfall and high flow conditions at the time of sampling were partly attributable for the large volume of discharge (180 gpm).

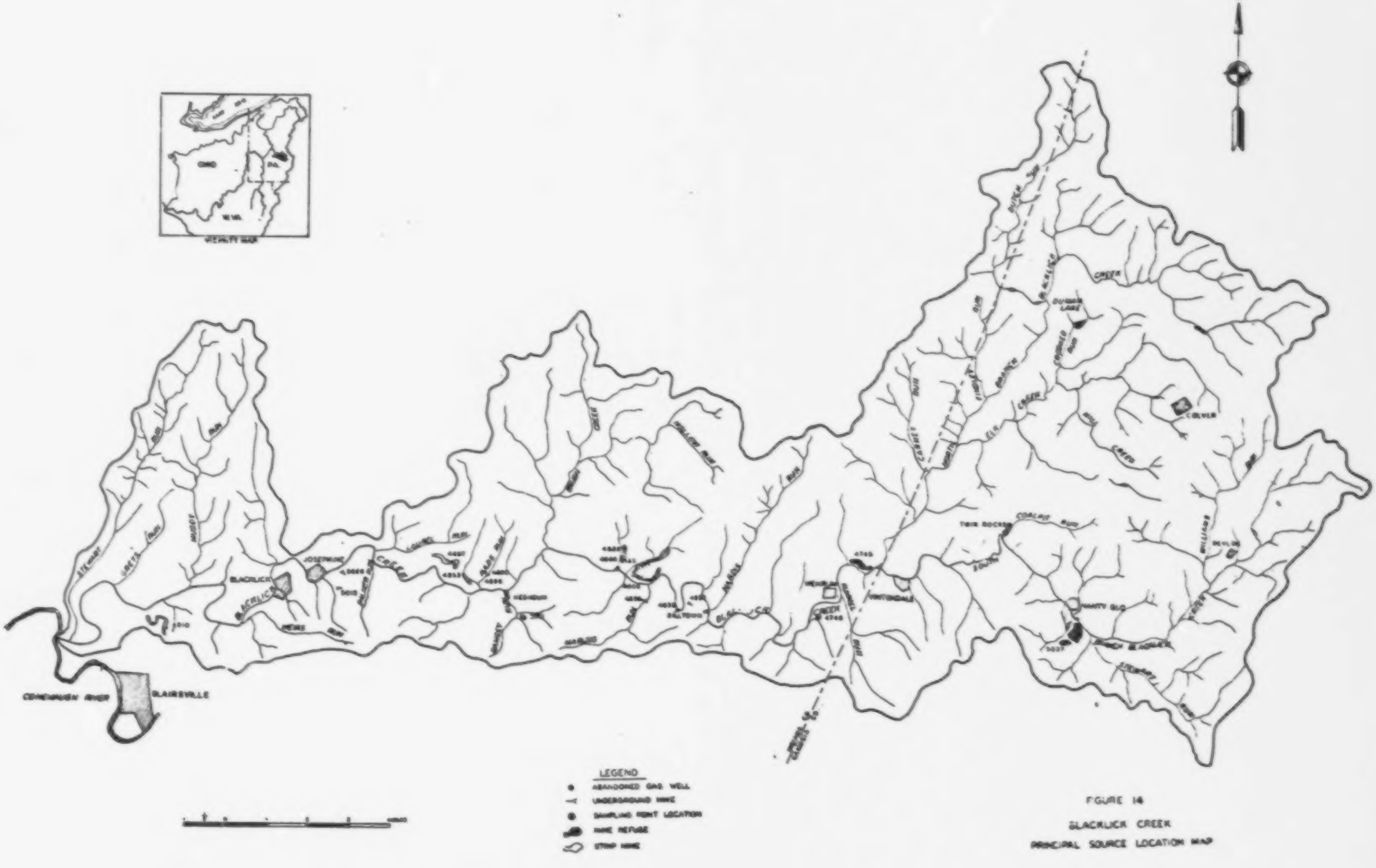
VICINITY MAP
OHIO
W. VA.
PA.
STEWART
GREYS RUN
MUDDY
RUN
RUN
CONEMAUGH RIVER
BLAIRSVILLE
BLACKLICK
BLACKLICK
JOSEPHINE
MENS RUN
CREEK
LAUREL RUN
DALTON
BLACKLICK CREEK
MIDDLE
HOLLOW RUN
RUN
CREEK
HEILWOOD
VINTONDALE
NEW RUN
RUN
STRAWL RUN
CARNEY RUN
NORTH BRANCH
ELK CREEK
BRANCH
DUTCH RUN
BLACKLICK
CREEK
DUMAN LAKE
COOKED RUN
MIN CREEK
COLVER
RUN
TWIN ROCKS
COALPIT RUN
SOUTH
WILLIAMS
REVLOC
NANTY GLO
SOUTH BRANCH
STEWART RUN
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE

FIGURE 14

BLACKLICK CREEK

PRINCIPAL SOURCE LOCATION MAP

Mine No. 4868

The 120 gpm effluent measured at this mine flows from the base of a slumped drift opening located at the edge of a contour surface mine. When in operation, the surface mine approached the underground opening as close as possible without actually disturbing the old entry. The acid load discharged to the unnamed Blacklick Creek tributary was 1,843 lb/day.

Mine No. 4869

This mine is the old Virginia No. 15 operated by the Standards Bituminous Coal Company. Mine operation was initiated in 1919. Two of the openings to the mine are still identifiable, an air shaft and a portal. Both openings have been intersected by a surface mine which terminated at this location. The air shaft was dry, however, a 90 gpm effluent discharged from the second opening. The acid load was 1,722 lb/day.

Mine No. 4890

Portions of the original concrete portal still remain at this site. This was the Virginia No. 14 mine originally opened in 1929 by the Standard Bituminous Coal Company. The mine was reportedly in operation until at least 1952 and the working covered approximately 860 acres (13). At the time of inspection a 405 gpm effluent drained from the still intact and open portal. The acid load discharged to Aulds Run was 9,987 lb/day.

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Mine No. 4893

At this site a 5 gpm effluent representing cumulative seepage was collected from the base of a spoil pile area associated with a surface mine. A portion of the disturbed surface area has been filled with waste material from a nearby active coal preparation plant. Percolation of surface water through this waste material results in numerous immeasurable seepage areas along the length of the surface mine. The 5 gpm cumulative sample represented only a portion of the total drainage. The acidity concentration of the drainage was 20,000 mg/l and the acid load was 1,200 lb/day.

Mine No. 4897

This surface mine has also been filled with waste material from a coal preparation plant. There were numerous discharges of highly mineralized effluent along the entire length of those portion of the disturbed area filled with refuse. A single representative sample of only 3 gpm carried an acid load of 2,205 lb/day. The acidity concentration was 61,250 mg/l. As a result of the immeasurable seepage areas the total load contribution from this site could not accurately be determined.

Mine No. 4898

This area has been surface mined, drift mined, and then portions of the surface mine have been filled with refuse from an active coal preparation plant. A portion of the originally unreclaimed surface mine spoil piles have been backfilled to cover the refuse material.

However, there were numerous areas of seepage about the base of the regraded spoil piles. A 15 gpm effluent, which represented the major discharge point, carried an acid load of 5,220 lb/day.

## Mine 4910

The 65 gpm effluent from Mine No. 4910 flows from an area which has been mined by both surface and underground methods. The 1,447 lb/day acid load is the largest discharge from a series of mines located along several small unnamed tributaries of Blacklick Creek.

## Mine No. 5018

Mine No. 5018 is located along a small unnamed tributary to Blacklick Creek near the community of Josephine. The mine portal has caved and the 250 gpm effluent emerges from the base of the slump area. The acid load discharged to the receiving tributary was 1.170 lb/day.

## Mine No. 5026

Mine No. 5026 is located along a small unnamed tributary to Blacklick Creek near the community of Josephine. The mine portal has caved and the 540 gpm effluent emerges from the base of the slump area. The acid load discharged to the recieving tributary was 3,467 lb/day.

## Site No. 5037

Near the community of Nanty Glo a large mine refuse dump is located adjacent to an unnamed Blacklick Creek tributary. As a result of surface water percolation through the pile there was considerable seepage along the base of the dump. The cumulative result of this seepage was the total water quality degradation of the tributary. At the lower end of the refuse area the tributary carried an acid load of 35,424 lb/day.

### Site No. 5076

The source of this acid discharge was another large refuse dump in the Nanty Glo area. It appears that a small spring may have been covered by the dump. At the point where the drainage emerges from the pile an 8 gpm flow was recorded. The acid load was 2,093 lb/day.

### Site No. 5571

The source of this acid discharge was an abandoned mine refuse dump on Ramsey Run. The 12 gpm effluent from the dump area carried an acid load of 4,709 lb/day. The acidity concentration of the highly mineralized effluent was 32,700 mg/l.

# TWO LICK CREEK
# MINE DRAINAGE INVENTORY

# TWO LICK CREEK

## SUMMARY AND CONCLUSIONS

1. Two Lick Creek drains an area of 190 square miles in Indiana County. The water quality of main stem Two Lick Creek is continuously polluted along its entire length as a result of coal mine discharges. This degraded water quality condition extends above the community of Wandin Junction along the entire length of the North Branch. The South Branch is the only major tributary in the watershed unaffected by coal mine drainage.

2. A total of 174 discharging sources and approximately 2,800 acres of surface mined land were investigated in the study area. Discharges from coal mine sources ranged from one to 985 gpm and totalled 10.2 million gallons per day (mgd). The total net acid load discharged by these sources was 36,645 lb/day.

3. Active mines were not a significant source of mine drainage pollution in the Two Lick Creek watershed. The net load from all active sites in the watershed was alkaline (508 lb/day).

4. Abandoned drift mines, shaft mines, and mine refuse piles were the major sources of mine drainage pollution in the study area. These three source types contributed an acid load of 30,858 lb/day. This load represented approximately 85 percent of the acid load discharged by all 174 sources in the Two Lick Creek watershed.

5. A total of twelve principal sources of mine drainage discharge were located in the study area. These sources include six drift mines, three combination mines, two mine refuse dumps, and one shaft mine. These twelve sources discharged a total acid load of 29,144 lb/day. This load represents approximately 80 percent of the total acid load measured in the watershed.

## DESCRIPTION OF AREA

Two Lick Creek drains an area of 190 square miles in Indiana County. The tributary arises in the east central corner of the county and flows generally southwest toward the confluence with Blacklick Creek near the community of Josephine.

The principal tributary to Two Lick Creek is Yellow Creek. This tributary drains an area of 67 square miles or about one-third of the total Two Lick Creek watershed.

Coal mine operations in the Two Lick Creek area are extensive in nearly all portions of the watershed. The only area in the watershed where mines were noticeably absent was the 22 square mile area of the South Branch.

The majority of discharging mine sites in the Yellow Creek drainage area were confined to that area below the Homer City water supply reservoir. A few sites are located immediately above the reservoir and one additional area of mining activity was located near the headwaters of Little Yellow Creek in the vicinity of Heilwood.

## STREAM WATER QUALITY

The water quality of main stem Two Lick Creek is continuously polluted along its entire length as a result of coal mine discharges. This degraded water quality condition also extends above the community of Wandin Junction along the entire length of North Branch Two Lick Creek. The South Branch of Two Lick is unaffected by mine drainage.

The quantity and quality of the mine discharges were such that the stream water quality was continuously degraded. There was no point along the main stem where the water quality of Two Lick Creek was improved by alkaline tributary inflow or by dilution and neutralization of the upstream discharges.

During the course of the 1968 field study, several stream locations were sampled for chemical analysis (Table 23). These stations were selected to measure the cumulative effects of mine drainage. A summary of this stream data is presented in Table 24. The locations of the sampling points are shown in Figure 15.

## SOURCES OF MINE DRAINAGE

An estimated 400 mining sites and approximately 2800 acres of surface mined land were investigated during the Two Lick Creek study. Samples for chemical analysis were collected from 174 sources discharging at the time of survey. The total effluent from these sources was more than 10 million gallons per day (mgd). The total net acid load discharged to streams in the Two Lick Creek watershed was 36,645 lb/day.

## TABLE 23

## Stream water quality sampling Stations

## Two Lick Creek

| Station Number | Sampling Period | Stream | Location |
|---|---|---|---|
| 4747 | May, Oct., 1968 | Tearing Run | near mouth |
| 4778 | May, June, Oct. 1968 | Yellow Creek | near mouth |
| 4779 | May, Oct., 1968 | Yellow Creek | at USGS Gage |
| 4780 | May, June, Oct. 1968 | Little Yellow Creek | near mouth |
| 4781 | May, June, Oct. 1968 | Yellow Creek | just above mouth of Little Yellow Creek |
| 4782 | May, Oct. 1968 | Little Yellow Creek | at Route 422 |
| 4783 | May, June 1968<br>Feb. 1969 | Two Lick Creek | just above mouth |
| 4784 | May, June 1968<br>Feb. 1969 | Penn Run | near mouth |
| 4785 | May, June, Oct. 1968 | Dixon Run | near mouth |
| 4786 | May, June, Oct. 1968 | Buck Run | near mouth |
| 4787 | May, June, Oct. 1968 | North Branch Two Lick Creek | near mouth |
| 4788 | May, June, Oct. 1968 | South Branch Two Lick Creek | near mouth |
| 4789 | May, June 1968 | Unnamed trib to Yellow Creek | near mouth |
| 4790 | May, June 1968 | Unnamed trib to Yellow Creek | near mouth |
| 4792 | May, 1968 | Two Lick Creek | near mouth |
| 4984 | June, 1968 | Two Lick Creek | near mouth |

# Table 2A

## Stream water quality data

## Two Lick Creek

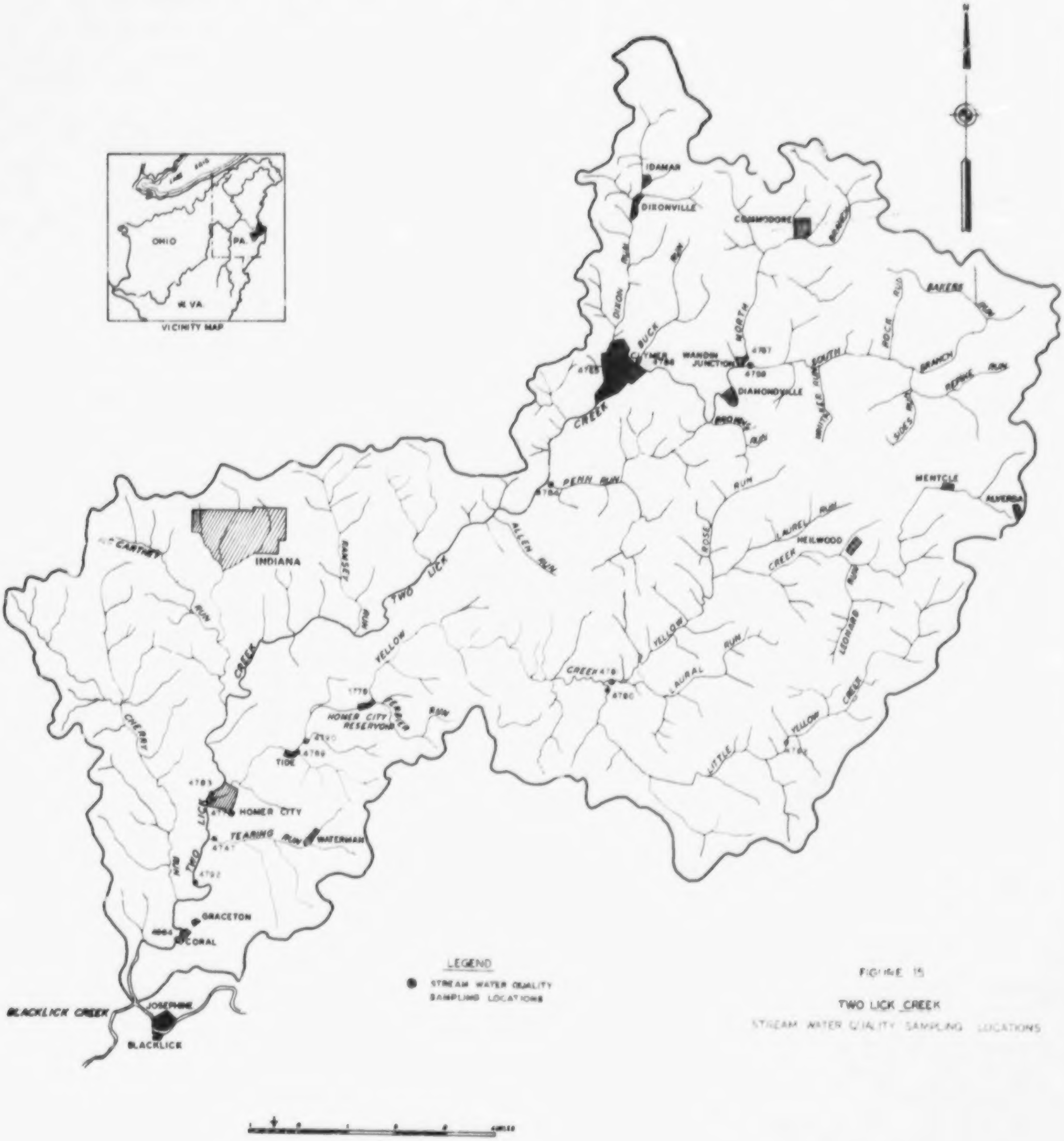
| Station No. | Sampling Date | Flow (gpm) | pH | Specific Conductance | Total Acidity mg/l | Total Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6767 | May 16, 1968 | 4,352 | 3.4 | 900 | 144 | 7,520 | 174 | 9,087 | 300 | 15,667 | 6.0 | 313 | 2.0 | 104 | 8.7 | 454 |
| 6767 | Oct. 16, 1968 | 200 | 2.6 | 2300 | 825 | 1,980 | 328 | 787 | 1,100 | 2,664 | 67.5 | 162 | 7.5 | 18 | 35.0 | 84 |
| 6767 | Nov. 13, 1968 | 150 | 3.1 | 1600 | 415 | 747 | 219 | 394 | 645 | 1,161 | 40.6 | 73 | 5.3 | 10 | 23.4 | 42 |
| 6778 | May 7, 1968 | 21,271 | 3.5 | 380 | 5 | 1,276 | 79 | 20,165 | 165 | 42,117 | 13.6 | 3,471 | 0.8 | 204 | 7.2 | 1,838 |
| 6778 | June 7, 1968 | 37,000 | 3.4 | 625 | 150 | 66,600 | 75 | 33,300 | 200 | 88,800 | 28.0 | 12,432 | 1.0 | 444 | 8.7 | 3,863 |
| 6778 | Oct. 16, 1968 | 1,685 | 3.2 | 960 | 300 | 6,066 | 133 | 2,689 | 410 | 8,290 | 28.2 | 570 | 2.6 | 53 | 17.5 | 354 |
| 6779 | May 7, 1968 | 5,400 | 7.1 | 170 | -3 | -194 | 61 | 3,953 | 50 | 3,240 | 0.2 | 13 | 0.1 | 6 | 1.4 | 91 |
| 6779 | May 15, 1968 | 85,050 | 8.3 | 360 | 23 | 23,474 | 65 | 66,339 | 185 | 188,811 | 0.2 | 204 | 0.4 | 408 | 0.9 | 919 |
| 6779 | Oct. 16, 1968 | 2,070 | 7.5 | 300 | -41 | -1,018 | 130 | 3,229 | 100 | 2,484 | 0.0 | 0 | 0.2 | 5 | 0.7 | 17 |
| 6780 | May 8, 1968 | 4,922 | 7.8 | 120 | 2 | 118 | 45 | 2,658 | 30 | 1,772 | 0.2 | 12 | 0.1 | 6 | 1.1 | 65 |
| 6780 | June 6, 1968 | 11,710 | 8.1 | 155 | 18 | 2,329 | 45 | 6,323 | 20 | 2,810 | 0.7 | 98 | 0.1 | 14 | 1.6 | 225 |
| 6780 | Oct. 15, 1968 | 610 | 7.6 | 310 | 41 | 300 | 78 | 571 | 60 | 439 | 0.2 | 1 | 0.2 | 1 | 0.9 | 7 |
| 6781 | May 8, 1968 | 8,817 | 7.4 | 245 | 5 | 529 | 89 | 9,417 | 80 | 8,464 | 0.3 | 32 | 0.1 | 11 | 1.0 | 106 |
| 6781 | June 6, 1968 | 16,163 | 8.0 | 300 | -3 | -582 | 87 | 16,874 | 70 | 13,577 | 0.3 | 58 | 0.1 | 19 | 1.0 | 194 |
| 6781 | Oct. 15, 1968 | 1,682 | - | 480 | 702 | 6,077 | 163 | 3,290 | 185 | 3,734 | 0.0 | 0 | 0.2 | 4 | 0.7 | 14 |
| 6782 | May 8, 1968 | 1,769 | 8.1 | 180 | -17 | -361 | 67 | 1,422 | 45 | 955 | 0.3 | 6 | 0.1 | 2 | 0.7 | 15 |
| 6782 | May 15, 1968 | 13,950 | 7.3 | 260 | 28 | 4,687 | 49 | 8,203 | 40 | 6,696 | 0.9 | 151 | 0.2 | 33 | 1.1 | 184 |
| 6782 | Oct. 15, 1968 | 369 | 7.0 | 485 | 3 | 13 | 210 | 930 | 155 | 686 | 0.1 | 0 | 0.3 | 1 | 1.4 | 6 |
| 6783 | May 9, 1968 | 33,989 | 4.5 | 650 | 80 | 32,629 | 190 | 77,495 | 305 | 124,400 | 8.9 | 3630 | 2.1 | 857 | 6.8 | 2,774 |
| 6783 | June 7, 1968 | 35,514 | 3.0 | 960 | 151 | 64,351 | 160 | 68,187 | 340 | 144,897 | 11.4 | 4858 | 1.9 | 810 | 10.1 | 4,304 |
| 6783 | Feb. 25, 1969 | 13,831 | 5.3 | 440 | 189 | 31,369 | 108 | 17,925 | 195 | 32,365 | 12.7 | 2108 | 1.6 | 266 | 5.9 | 979 |
| 6784 | May 9, 1968 | 1,777 | 4.8 | 550 | 45 | 960 | 258 | 5,501 | 325 | 6,930 | 13.0 | 277 | 4.0 | 85 | 3.6 | 77 |
| 6784 | June 6, 1968 | 2,997 | 3.3 | 975 | 191 | 6,869 | 179 | 6,438 | 400 | 14,386 | 24.0 | 863 | 5.9 | 212 | 10.1 | 363 |
| 6784 | Feb. 25, 1969 | 965 | 3.7 | 950 | 290 | 3,289 | 243 | 2,756 | 536 | 6,078 | 36.6 | 415 | 9.0 | 102 | 9.2 | 104 |
| 6785 | May 9, 1968 | 2,748 | 6.1 | 550 | 657 | 21,665 | 262 | 8,640 | 245 | 8,079 | 4.2 | 138 | 1.4 | 46 | 3.6 | 119 |
| 6785 | June 6, 1968 | 5,094 | 7.6 | 580 | 6 | 367 | 196 | 11,981 | 220 | 13,448 | 6.4 | 391 | 1.3 | 79 | 3.3 | 202 |
| 6785 | Oct. 17, 1968 | 416 | 7.6 | 945 | 242 | 1,202 | 510 | 2,534 | 4,000 | 19,872 | 1.3 | 6 | 1.8 | 9 | 2.3 | 11 |
| 6786 | May 9, 1968 | 935 | 3.3 | 1500 | 680 | 7,630 | 226 | 2,536 | 1,020 | 11,444 | 90.4 | 1,014 | 4.8 | 54 | 49.0 | 550 |
| 6786 | June 6, 1968 | 1,360 | 2.6 | 2100 | 950 | 15,595 | 174 | 2,856 | 1,275 | 20,930 | 290.0 | 4,761 | 4.5 | 74 | 52.3 | 859 |
| 6786 | Oct. 17, 1968 | 220 | 2.8 | 2300 | 1,225 | 3,234 | 358 | 965 | 1,290 | 3,406 | 180.5 | 477 | 6.2 | 16 | 64.1 | 169 |
| 6787 | May 9, 1968 | 3,823 | 4.8 | 580 | 38 | 1,743 | 245 | 11,240 | 280 | 12,845 | 2.5 | 115 | 1.1 | 50 | 3.6 | 165 |
| 6787 | June 6, 1968 | 8,748 | 3.3 | 900 | 70 | 7,348 | 204 | 21,415 | 250 | 26,244 | 8.2 | 861 | 0.9 | 94 | 4.1 | 430 |
| 6787 | Oct. 17, 1968 | 1,200 | 4.0 | 950 | 200 | 2,880 | 268 | 3,859 | 450 | 6,480 | 0.9 | 13 | 1.9 | 27 | 5.9 | 85 |
| 6788 | May 9, 1968 | 7,184 | 7.7 | 160 | -21 | -1,810 | 62 | 5,345 | 35 | 3,017 | 0.2 | 17 | 0.1 | 9 | 1.1 | 95 |
| 6788 | June 6, 1968 | 9,990 | 7.2 | 290 | 1 | 120 | 40 | 4,795 | 25 | 2,997 | 1.1 | 132 | 0.1 | 12 | 1.6 | 192 |
| 6788 | Oct. 17, 1968 | 675 | 7.6 | 420 | -105 | -851 | 79 | 640 | 60 | 486 | 0.1 | 1 | 0.0 | 0 | 3.0 | 24 |
| 6789 | May 10, 1968 | 360 | 2.7 | 1600 | 345 | 1,490 | 228 | 985 | 820 | 3,542 | 47.5 | 205 | 7.3 | 32 | 33.0 | 143 |
| 6789 | May 15, 1968 | 935 | 2.9 | 1300 | 500 | 5,610 | 130 | 1,459 | 660 | 7,405 | 51.3 | 576 | 5.1 | 57 | 29.8 | 334 |
| 6789 | June 6, 1968 | 460 | 2.6 | 2000 | 700 | 3,864 | 210 | 1,159 | 1,000 | 5,520 | 70.0 | 386 | 7.3 | 40 | 38.8 | 214 |

Table 24 (Continued)

Stream water quality data

Ten Lick Creek

| Station No. | Sampling Date | Flow (gpm) | pH | Specific Conductance | Total Acidity mg/l | Total Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6790 | May 10, 1968 | 600 | 2.8 | 2200 | 415 | 2,988 | 424 | 3,053 | 625 | 4,500 | 25.6 | 184 | 5.8 | 42 | 26.4 | 190 |
| 6790 | May 15, 1968 | 1,240 | 2.9 | 1300 | 400 | 5,952 | 188 | 2,797 | 560 | 8,333 | 37.4 | 557 | 4.3 | 64 | 23.8 | 354 |
| 6790 | June 10, 1968 | 540 | 2.8 | 2100 | 690 | 4,471 | 346 | 2,242 | 925 | 5,994 | 99.3 | 643 | 5.6 | 36 | 35.3 | 229 |
| 6792 | May 10, 1968 | 58,500 | 4.4 | 560 | 60 | 42,120 | 186 | 130,572 | 250 | 175,500 | 7.0 | 4,914 | 1.7 | 1,193 | 4.6 | 3,229 |
| 6792 | May 15, 1968 | 223,200 | 4.4 | 560 | 84 | 224,985 | 90 | 241,056 | 145 | 388,368 | 4.2 | 11,249 | 0.9 | 2,411 | 4.0 | 10,714 |
| 6804 | Jan. 12, 1968 | 103,330 | 3.2 | 850 | 205 | 254,191 | 133 | 164,915 | 320 | 396,787 | 13.1 | 16,243 | 2.1 | 2,604 | 10.9 | 13,516 |


VICINITY MAP
OHIO
PA
W. VA
IDAMAR
DIXONVILLE
COMMODORE
DIXON RUN
BUCK RUN
NORTH BRANCH
CLYMER
4785
4788
WANDIN JUNCTION
4787
4789
DIAMONDVILLE
SOUTH BRANCH
ROCK RUN
BAKERS RUN
BRANCH RUN
REPINE RUN
CREEK
BROWNS RUN
PENN RUN
4784
ALLEN RUN
ROSE RUN
MENTCLE
ALVERDA
LAUREL RUN
HEILWOOD
LEONARD RUN
McCARTNEY RUN
INDIANA
RAMSEY RUN
TWO LICK CREEK
YELLOW CREEK
LAURAL RUN
LITTLE YELLOW CREEK
4780
CHERRY RUN
4776
HOMER CITY RESERVOIR
FERRIER RUN
TIDE
4769
4783
HOMER CITY
TEARING RUN
WATERMAN
4747
4792
GRACETON
CORAL
BLACKLICK CREEK
JOSEPHINE
BLACKLICK
MILES

LEGEND

● STREAM WATER QUALITY SAMPLING LOCATIONS

FIGURE 15

TWO LICK CREEK

STREAM WATER QUALITY SAMPLING LOCATIONS

A description of the mine drainage sources follows. All mine site locations in the Two Lick Creek watershed are shown in Figure 16.

## TWO LICK CREEK

### North Branch

Six small surface mines and three underground mine openings were located at the very headwaters of the North Branch above Route 286. Three of these mines were discharging at the time of inspection. These were Mine No.'s 4199, 4200, and 4751. However, the net load from these sources was alkaline (2 lb/day).

In downstream order, the next sources of mine drainage were located in the immediate vicinity of Commodore. The largest discharge in the area resulted from the Commodore Mine. The effluent was artesian in nature and was measured at 985 gpm. However, the load from the mine (No. 4197) was alkaline. Mine No. 4198 is located on the west side of Route 286 and contributed an acid load of 319 lb/day. Mine No. 4196 was located just north of Commodore and contributed an acid load of 180 lb/day.

Areas of the North Branch between Commodore and the confluence with the South Branch at Wandin Junction has been extensively mined. This activity is most extensive along the west bank. Small drift mines and surface mines have been developed in at least two coal seams which outcrop along the hillsides. The largest single source of mine drainage discharge in this area resulted from Mine

No. 4171. There are two openings at this site and they contributed a combined effluent of 135 gpm. The acid load was 350 lb/day. Another major source of discharge was contributed by Mine No. 4186, a slumped drift mine. The acid load was 108 lb/day.

Stream sampling was conducted near the mouth of North Branch coincident with the source inventory. During this period, the stream carried an acid load ranging from 1,743 lb/day to 7,348 lb/day (Station No. 4787, Table 24).

## South Branch

At the time of the mine drainage source investigation, coal mine operations were totally absent in the 21.9 square mile drainage area of South Branch. A stream water quality sampling station was located at the mouth of the South Branch. During the sampling period, the pH of the stream ranged from 7.2 to 7.6. On two of the three sampling occasions, the stream carried a net alkalinity concentration. The one time the stream carried a net acid load the concentration was only one mg/l. (Station No. 4788, Table 24).

## Two Lick Creek, Wandin Junction to Buck Run

A slope mine is located immediately below the confluence of the North and South Branches at Wandin Junction. The portal was still open but the mine was completely inundated with water and there was no drainage. A negligible acid load was carried by drainage seeping from the refuse pile associated with the mine.

Mine No. 4165 was located on the north bank of Two Lick Creek downstream of the small community of Diamondville. The upstream opening contributed a discharge of 310 gpm which carried an acid load of 3,274 lb/day. A second opening was dry. A contour surface mine is located approximately 100 vertical feet above Mine No. 4165. This surface mine parallels Two Lick Creek for approximately 0.5 mile and then runs along an unnamed tributary to the main stem. A total of four discharge points were found in the area disturbed by the mine. The combined acid load from these discharges (No.'s 4160, 4161, 4162, 4164) was 258 lb/day.

The Cherryhill No. 3.Mine operated by the Imperial Coal Company was located on main stem Two Lick Creek directly across from Mine No. 4165 described above. The mine was not active at the time of inspection. Drainage from the mine was channeled to a series of recently constructed settling ponds. There was no drainage from the ponds to Two Lick Creek. At present time (1971) the mine has been closed and according to Commonwealth records, produces an acid effluent which drains to Two Lick Creek.

Mine No. 4166 was located on the south bank of Two Lick Creek near the Clymer Fire Tower. This mine had apparently been sealed at one time, but the 50 gpm effluent has broken through to the surface about 15 feet from the seal. The acid load discharged to Two Lick Creek was 2,664 lb/day.

## Buck Run

Mine No. 1270 is a drift opening located in the base of a highwall in an unreclaimed surface mine area. The acid load discharged to the headwaters of Buck Run was 79 lb/day. In downstream order, the next significant discharge was contributed by Mine No. 4154. The acid load from this slumped drift opening was 432 lb/day. Mine No. 1273 is located on an unnamed tributary to Buck Run. The area has been mined by both surface and underground mining methods. The 35 gpm discharge emerges via wooden drainage pipe from the disturbed area. The acid load discharged to the unnamed tributary was 155 lb/day.

A contour surface mine is located along the east bank of Buck Run. Numerous drift mine openings have been developed in the base of the existing highwalls. One of these drift mines (No. 4159) contributed an acid load of 615 lb/day to Buck Run

A total of 14 discharging mine sites were located in the 3.1 square mile drainage area of Buck Run. These mines contributed a combined acid load of 1,435 lb/day.

Stream sampling Station No. 4786 was located near the mouth of Buck Run. The stream was sampled for water quality analysis during May, June, and October coincident with the mine drainage source investigations. During this period, Buck Run exhibited pH values ranging from 2.6 to 3.3 and carried an acid load ranging from 3,234 lb/day to 15,595 lb/day (Table 24).

## Dixon Run

The first sources of mine drainage discharge in the 10 square mile drainage area of Dixon Run were located at the very headwaters of the tributary. The only major discharge resulted from Mine No. 1284. At this mine, a 30 gpm effluent was sampled. This drainage represented cumulative seepage from a surface mined area. The acid load discharged to the headwaters of Dixon Run was 202 lb/day. An acid load of 180 lb/day was measured below a surface and underground mined area near the community of Idamar. This was mine No. 1291 and the drainage actually represents a combination of several effluents.

The Barr Slope Mine is located on an unnamed tributary to Dixon Run just downstream from the community of Dixonville. This mine was dry at the portal. A local resident reported that drainage from this mine as well as from other underground mines on the west side of Dixon Run is discharged by the Tanoma borehole. This borehole is located on an unnamed tributary to Crooked Creek on the opposite side of the drainage divide separating Dixon Run and Crooked Creek. Crooked Creek is a tributary to the Allegheny River. During the field survey, the presence of the Tanoma borehole was verified but no water quality information was obtained.

An artesian effluent of 30 gpm was located on the eastside of Dixon Run south of Dixonville. The discharge may represent a borehole from one of the mines in a deeper coal seam which does not outcrop on Dixon Run. The acid load carried by this discharge (No. 4184) was 207 lb/day.

An active drift mine, operated by the F P & K Coal Company was in operation on an unnamed tributary to Dixon Run. At the time of inspection, this mine discharged an alkaline effluent (Mine No. 1295).

Both underground and surface mines were located along both banks of the downstream reach of Dixon Run. However, these mines were either dry or contributed only minor acid or alkaline loads.

### Two Lick Creek, Dixon Run to Penn Run

A contour surface mine approximately two miles in length is located high on the south bank hillside just downstream from the community of Clymer. Actually there are two segments to the mine. The first short section is connected via haul road to the much longer second section.

Numerous drift mine openings have been developed in the highwall of these surface mines. Most or all of these openings were associated with the abandoned Cherryhill No. 1 Mine. Three drainage sources were located in the first (short) section of the strip mine. Four drift openings are located in the highwall of this section. The portals are still open but have been sealed with cement blocks about 20 feet inside the openings. Drainage was seeping around the sides of at least two of these seals. Each of the three discharges represent seepage from the drift openings or from the surface mine spoil piles. The combined acid load from No.'s 4700, 4701, and 4702 was 17 lb/day.

A discharge of 105 gpm flowed from the base of a slumped drift opening immediately adjacent to the beginning of the second segment of the surface mine described above. The discharge is via pipe which extends from the caved mine opening. This effluent is channeled to two settling ponds and then overflows to Two Lick Creek. Treatment facilities have obviously been used at one time to treat this effluent but had since been removed. There were numerous bags of unused and spoiled lime remaining at the site. The acid load contributed by this source was 1,103 lb/day (No. 4704).

Two additional mine openings were located in the base of the highwall approximately 0.4 mile from Mine No. 4704 described above. At least one of these openings had been sealed about 40 feet inside the opening. Drainage from these two openings contributed an acid load of 244 lb/day (Mine No. 4703).

Two additional discharges, representing cumulative seepage, were located along the bottom edge of the strip mine. These were No.'s 4705 and 4706 with a combined acid load of 92 lb/day.

A large abandoned mine is located along an unnamed tributary which enters Two Lick Creek on the north bank. The entry to the mine was dry. However, several samples representing cumulative seepage were collected at the base of the large refuse pile associated with the mine. These were discharge No.'s 4710 and 4711. A nine gpm effluent was measured at No. 4710. The acidity concentration of this effluent was 45,700 mg/l and it carried an acid load of 4,936 lb/day. The acid load contributed by No. 4711 was 456 lb/day.

The Dixon Run Coal Company operated a drift mine located along main stem Two Lick Creek on the bank opposite the confluence of Penn Run. The Dixon Run Mine was developed in the base of a strip mine highwall. At the time of inspection, this mine contributed an acid discharge of 14 lb/day. At the present time, it is reported that the mine has closed.

Penn Run

The water quality along much of the length of main stem Penn Run was affected by mine drainage. Several abandoned surface mines were located near the headwaters of the tributary. These operations were dry. Three surface mines were active at the time of survey. These operations were also dry at the time of inspection. However, numerous seepage areas were located immediately adjacent to the bank of Penn Run. The cumulative effect of these effluents were sufficient to degrade the water quality of Penn Run. Surface mine operations were located on the hillside above the area of these seepage points.

The Cherryhill No. 4 Mine was located along the south bank of Penn Run. This operation was a drift mine developed in the highwall of a recently reclaimed surface mine. The Cherryhill Mine was not in operation at the time of inspection. However, a treatment facility was in operation at the mine. A 360 gpm effluent was lime treated and aerated over limestone prior to discharge to a settling pond. The final effluent discharged to Penn Run carried an alkaline load of 531 lb/day. (No. 4716).

Although the treatment facility produced an alkaline discharge, the effluent carried a total iron concentration of 28.5 mg/l. As a result, the effluent was highly discolored and produced a similar discoloration along the entire downstream reach of Penn Run.

The Cherryhill No. 4 Mine has since been closed and sealed. However, it is reported that the mine produces an acid discharge. It has also been reported that one section of this mine has been intersected by auger holes from a nearby surface mine, thus limiting the effectiveness of the mine seal.

Stream water quality sampling was conducted at the mouth of Penn Run coincident with the mine inventory. During this period, Penn Run carried an acid load ranging from 960 lb/day to 6,869 lb/day (Table 24, Station No. 4784).

## Two Lick Creek, Penn Run to Allen Run

A hillside contour surface mine approximately one mile in length is located along main stem Two Lick Creek just downstream from the mouth of Penn Run. A drift mine had been operative near the downstream end of this operation. This mine was operated by the Penn Hills Coal Corporation and had been closed just prior to inspection. All three portals were still open and each contributed drainage. The combined acid load discharged from these three openings (No. 5150) was 53 lb/day. The upstream portion of this surface mine was an extension of the older workings in which the Penn Hills mine was located. This newer section had been reclaimed and Penn

Hills was in the process of developing a new drift mine.

An unreclaimed surface mine was located along Two Lick Creek on the bank opposite the area described above. Two drift openings were located in the base of the strip mine highwall but were dry. Discharge No.'s 4713 and 4714 were located below the base of the strip mine spoil piles. The combined acid load of these two effluents was 126 lb/day.

## Allen Run

Contour surface mines are located along both banks of Allen Run. Two drainage sources were located at one operation and the other was dry. The two discharging sources contributed a combined acid load of 24 lb/day (No.'s 4756 and 4757).

An active drift mine, operated by the Chestnut Ridge Mining Company, was in operation near the headwaters of Allen Run. The mine is located in the base of a surface mine highwall. This mine had a small treatment facility but since the mine was dry at inspection, this facility was not in operation.

## Two Lick Creek, Allen Run to Ramsey Run

Several combination surface and underground mines were located along the bank of Two Lick across from the mouth of Allen Run. These mines and possibly a few others have become inundated as a result of the new Two Lick Creek Reservoir. At the time of the source investigation, this reservoir was under construction and has since been completed.

An active drift mine, operated by the Peles Brothers Coal Corporation, was in operation on an unnamed tributary to Two Lick Creek, a short distance below the mouth of Allen Run. This mine was dry at the time of inspection.

### Ramsey Run

With the exception of a small seepage area near its mouth, Ramsey Run is uneffected by mine drainage discharges. The exact origin of this single discharge, No. 4758, is not known but it may result naturally from a coal outcrop in the stream bed. The load carried by the 8 gpm effluent was alkaline with some minor discoloration.

### Two Lick Creek, Ramsey Run to Yellow Creek

The R & P Lucerne No. 3-A Mine is located on Two Lick Creek, a short distance below the mouth of Ramsey Run. At this point, the coal is hauled across Two Lick Creek and through the hill separating the Two Lick and Yellow Creek drainage areas. The coal finally emerges at the preparation plant located on Yellow Creek. The drainage from the mine is pumped to the surface near the portals on Two Lick Creek. At the time of inspection, approximately 100 gpm was piped through a revolving drum which contained limestone. After emerging from the drum, the drainage was piped to a settling pond prior to discharge to Two Lick Creek. The final effluent carried an alkaline load of 60 lb/day and the iron concentration was 2.0 mg/1 (Mine No. 5153).

The Lucerne 3-A mine is now reported by the Commonwealth as closed and sealed. However, acid seeps have occurred around the seals and also from a discharge pipe within one of the seals.

Mine No. 4791 was the last source of mine drainage discharge above the mouth of Yellow Creek. It appears that a shaft or similar mine entry has been sealed at this site on the bank of Two Lick Creek. A wooden drainage pipe emerges from the bank of the stream approximately 20 feet from the old capped mine entry. The discharge was 320 gpm and carried an acid load of 7,910 lb/day.

During the survey period, Two Lick Creek above Yellow Creek carried an acid load ranging from 31,369 lb/day to 64,351 lb/day.

## Tearing Run

A total of 19 mine drainage discharges were located in the 4.7 square mile drainage area of Tearing Run. The combined acid load from the sources was 5,657 lb/day. Mine No.'s 4769 and 4771 were both major sources of underground mine discharge. These mines are located on the main stem of Tearing Run near the community of Waterman. The remains of what appears to be a mine seal is located at the opening of Mine No. 4769. A 90 gpm discharge from this seal carried an acid load of 1,793 lb/day. Mine No. 4771 is located adjacent to several old mine buildings in the same general vicinity as Mine No. 4769. There are two openings about twenty feet apart at Mine 4771. The combined effluent from these openings was 380 gpm which carried an acid load of 1,778 lb/day.

A strip mine, which discharges to a tributary of Tearing Run, is a major source of mine acid discharge. This mine is a steeply pitched contour strip mine with a vertical relief of nearly 400 feet. There were numerous seepage areas occurring at the base of the high wall. This drainage then flows along the floor of the strip cut until it drains away from the mined area via natural drainways through the spoil piles. A total of five such discharges were located along the one mile length of this mine. The combined acid load of these five sources (No.'s 4737, 4738, 4739, 4740, 4741) was 1,604 lb/day.

## Two Lick Creek, Tearing Run to Mouth

A surface and underground mined area near the community of Graceton contributed numerous discharges to Two Lick Creek. At least one large underground mine was once operative in this area. This activity was followed by surface mine operations which partially destroyed or covered some of the old mine entries. There is considerable seepage around the lower edge of the entire complex. This drainage emanates from both the strip mine spoil piles and the refuse piles associated with the earlier underground mine.

The largest acid discharge in the area described above drains from Mine No. 4728. At this site, a caved portal was located along the hillside. Approximately 50 feet below the old portal, three mine effluents emerged from the hillside. The combined flow of these effluents was 220 gpm and the acid load was 2,746 lb/day.

Another source of underground drainage resulted from Mine No. 4732. The 30 gpm effluent emerges from the base of the slumped drift opening and follows a drainage course adjacent to a bank of coke ovens. This effluent then combines with the drainage from Mine No. 4728. The acid load discharged by Mine No. 4732 was 128 lb/day. An additional acid load of 303 lb/day was contributed by drainage from the strip mine and the refuse piles (No.'s 4729, 4730, 4731, and 4733).

Mine No.'s 4727 and 4734 are drift mines located just a short distance from the complex mentioned above. It is not known whether these mines interconnect with this area or whether they are associated with the next downstream mines at Coral. The acid loads discharged by Mine No.'s 4727 and 4734 were 284 lb/day and 117 lb/day, respectively.

A large slope mine once operated at Coral. Several banks of beehive coke ovens still remain at this old mine site. Both slope openings to this mine were dry. However, the portals appeared to be water filled a short distance inside the openings. Discharge No. 4725 represents the overflow from a pond located at the Coral complex. This pond was probably used for quench water for the coke ovens or may have been used in a coal preparation plant. The acid load was 28 lb/day.

## YELLOW CREEK

### Headwaters Area

Several underground and surface mines were located at the headwaters of Yellow Creek near the small community of Alverda. Mine No. 4182 was the only source of mine drainage discharge in this area and the acid load was negligible. Several shaft and/or slope openings to deeper coal seams were also found but were dry. One non-discharging surface mine pond was sampled (No. 4183), however, the pond was highly alkaline.

The community of Mentcle is located along Yellow Creek, a short distance downstream of Alverda. A large slope mine is located in the community of Mentcle. The main portal and air shaft were dry although there was noticeable subsidence behind the caved slope opening. This was the Bethlehem No. 11 Mine (Heilwood Division). Although dry at the portal, this mine contributed a discharge of 819 gpm near Heilwood, the next downstream community. Locally, the discharge is known as the "Heilwood Flume". The discharge was alkaline and carried an alkaline load of 845 lb/day.

Three additional mine openings, reported locally as the Bethlehem No.'s 6, 7, and 8 Mines, are located on the hillside approximately one mile upstream of Heilwood. There are three separate mine openings in this area. Each of these openings are associated with a sizable refuse pile. Mine No. 4179 was the only one of the three openings contributing drainage at the time of inspection. The acid load from this source was 12 lb/day.

## Leonard Run

The active Valley Coal Company No. 8 Mine is located on the east bank of Leonard Run near the headwaters of the tributary.

The mine is located in the base of a strip mine highwall. At the time of inspection, this mine produced an effluent of 60 gpm (No. 5148). This acid drainage was then lime treated and sent to a series of settling ponds. However, the final effluent from the pond carried an acidity concentration of 53 mg/l with a resultant acid load of 38 lb/day. A second acid discharge (No. 5149) of 18 lb/day emanated from the refuse scattered about the Valley No. 8 Mine site. The present status of this mine is unknown.

Additional surface and underground mines are located along both banks of Leonard Run. In general, the discharges from these mines contributed acid loads of less than 10 lb/day. One of the underground mines was reported as the Bethlehem No. 3 Mine. This drift mine is located on the east bank of Leonard Run near its confluence with Yellow Creek south of Heilwood. There was noticeable subsidence around the portal area. The 20 gpm effluent carried an acid load of 14 lb/day (Mine No. 4125).

The Valley Coal No. 2 preparation plant is located on the east bank of Leonard Run near its mouth. As of February 1971, this facility was listed as "in compliance" by the Pennsylvania Department of Environmental Resources.

There were no additional coal mine sites located in that portion of the Yellow Creek watershed above the confluence of Little Yellow Creek.

## LITTLE YELLOW CREEK

A total of fifteen surface mined areas were located along the banks of Yellow Creek in the headwaters area. Several of these operations were active at the time of survey. There were no drainage sources emanating from the surface mined areas. One strip mine pond was sampled and the alkalinity concentration was 41 mg/l (No. 4178).

Drift mines had been developed in two of the surface mines. The underground mine in the northernmost surface mine was abandoned and dry. Both the Glory Coal Company and the Valley Coal Company operate underground mines in the second surface mined area. The Glory No. 2 Mine was dry. Treatment facilities for the Valley No. 11 Mine had been installed but, for a lack of drainage at inspection time, these facilities were not in use.

There were no additional coal mine operations located in the downstream areas of the Little Yellow Creek drainage area.

## YELLOW CREEK BELOW LITTLE YELLOW CREEK

Only a limited number of coal mine operations were located along Yellow Creek between the mouth of Little Yellow Creek and the area downstream near the Homer City water supply reservoir. The few drift mine operations which were located, are in the general vicinity of the New Yellow Creek dam approximately one mile downstream of the old route 259 crossing of Yellow Creek. Much of this surrounding area has been cleared for the formation of a new lake on Yellow Creek. Mine No. 4122 was the only source of discharge and contributed an acid load of only 2 lb/day. Several mine openings near the dam site have been sealed as part of the overall development of Yellow Creek State Park.

## Yellow Creek, Homer City Reservoir to Mouth

Yellow Creek supports stocked trout and other fish over its entire length down to and including the Homer City water supply reservoir. A short distance below the reservoir, the stream becomes grossly polluted as a result of coal mine discharges.

Both surface and underground mines are located along both banks of Yellow Creek in the vicinity of the reservoir. Point sources of mine drainage contributed only minor acid loads. However, refuse areas and numerous unreclaimed spoil banks add immeasurable amounts of acid to the stream. The north bank of Yellow Creek has been mined by surface and underground methods in at least two coal seams. In places, the outcrop has been "punch mined" with as many as ten drift openings occurring side-by-side.

An unnamed tributary, which enters Yellow Creek approximately 0.4 mile upstream from the community of Tide, discharges a significant acid load to the receiving stream. Mine No. 1263 was the largest source of acid discharge on this small tributary. The mine has been sealed and a 25 gpm effluent discharged from the base of this seal. The acid load was 810 lb/day. Another mine opening (No. 1264) is located about 200 feet north of Mine No. 1263. The discharge from Mine No. 1264 was 12 gpm with a resultant acid load of 40 lb/day. Drift Mine No. 1265 discharged an acid load of

36 lb/day while Mine No. 1266, a combination underground and surface mine, contributed an additional acid load of 176 lb/day.

Near the mouth of the unnamed tributary mentioned above, the stream also receives an undetermined amount of seepage from the large refuse pile at Tide. During the period of survey, this small tributary carried an acid load ranging from 2,988 lb/day to 5,952 lb/day (Table 24, Station No. 4790).

A second unnamed tributary enters Yellow Creek at Tide. This tributary drains a small area of the watershed immediately south of the unnamed tributary described above. Discharge No.'s 1261 and 1262 were the major sources of mine drainage discharge on this tributary. Both effluents represent cumulative seepage from the base of strip mine spoil piles. It also appeared that the area had been drift mined. The acid loads discharged by No.'s 1261 and 1262 were 312 lb/day and 936 lb/day, respectively. Additional discharges contributed a combined acid load exceeding 130 lb/day. However, this tributary also receives an undetermined amount of seepage from the large refuse pile at Tide. During the period of survey, this unnamed tributary discharged an acid load to Yellow Creek which ranged from 1,490 lb/day to 5,610 lb/day (Table 24, Station No. 4789).

In the vicinity of Tide, Yellow Creek acquired the gross discoloration evident along the remaining downstream length. Refuse and other waste material is scattered along the bank of Yellow Creek. Much of this material is washed into the stream itself. The large refuse pile located on the nearby hillside covers some 40 acres. Seepage areas are evident along nearly the entire length of these refuse areas. It is the cumulative effect of these effluents in combination with the two unnamed tributaries described above which totally degrade the water quality as well as the aesthetic appearance of Yellow Creek. A few of the seepage areas were sampled during the study. These discharges exhibited acidity concentrations as high as 15,250 mg/l (No. 5006). The iron concentration of this sample was 1,178 mg/l.

A 50 acre refuse dump from the Lucerne Mines is located along the bank of Yellow Creek, a short distance below Tide. As with the Tide refuse area, this disposal area also contributes an undetermined amount of mine acid and solid materials to Yellow Creek. Only one of the seepage areas was sampled and the 3 gpm effluent carried an acid load of 161 lb/day (No. 5001). A sludge pond associated with the same Lucerne complex also contributed an acid load of 21 lb/day (No. 1254). The operating Lucerne Mine discharged its effluent to Two Lick Creek and is discussed in an earlier section of this document.

The last source of discharge in the Yellow Creek drainage area resulted from an undetermined source. The effluent discharged intermittently from what appeared to be a bore hole pipe located at the edge of the cooling water pond from the old power plant on the east side of Route 119 almost directly across from the Homer City Water Works. Discharge from this bore hole pipe was observed on

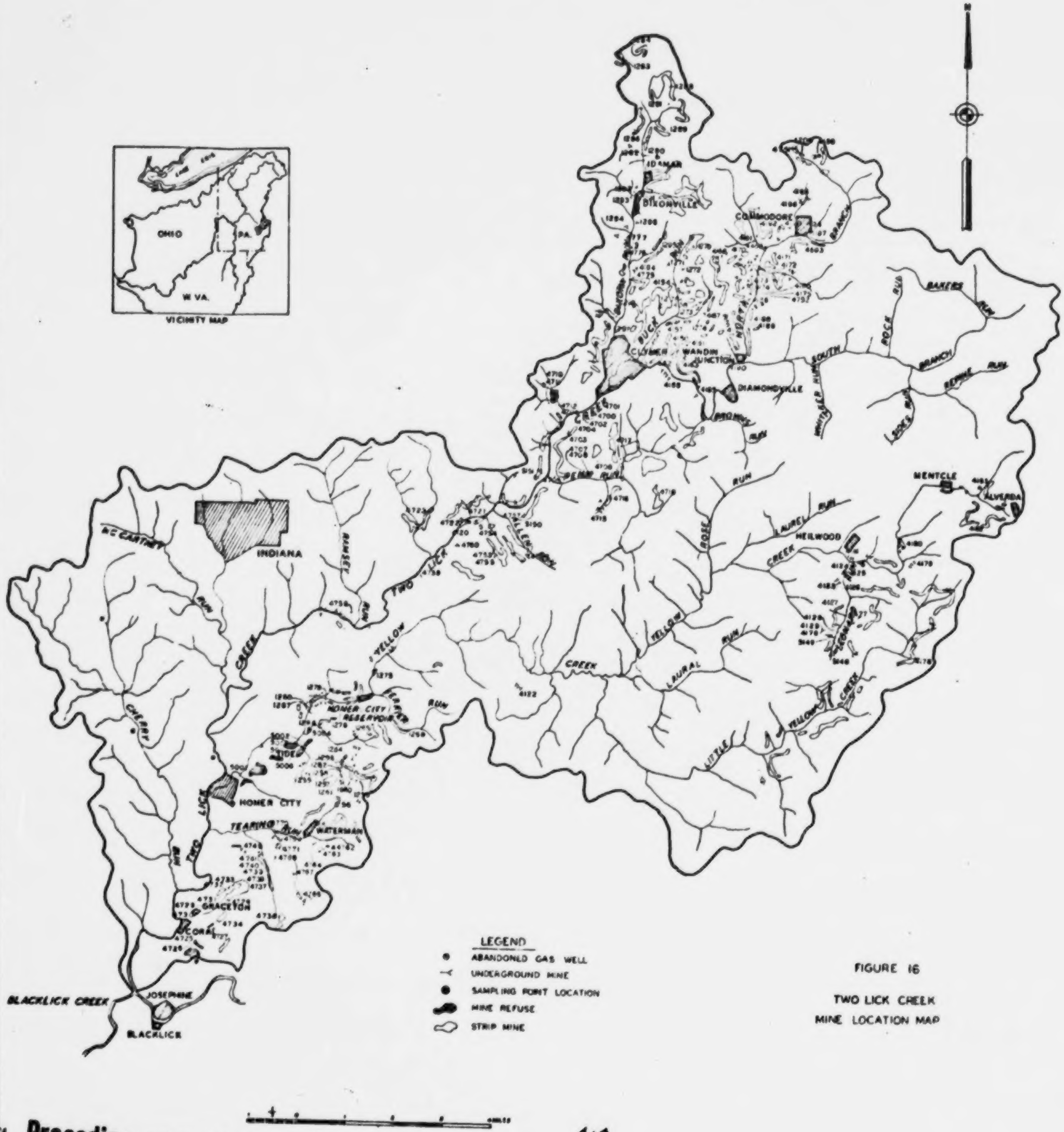

VICINITY MAP
OHIO
PA.
W VA.
DIXONVILLE
COMMODORE
CLYMER
WANDIN JUNCTION
DIAMONDVILLE
INDIANA
MENTCLE
ALVERDA
HEILWOOD
HOMER CITY RESERVOIR
HOMER CITY
WATERMAN
GRACETON
CORAL
JOSEPHINE
BLACKLICK
BLACKLICK CREEK
TWO LICK CREEK
YELLOW CREEK
LITTLE YELLOW CREEK
CHERRY RUN
MC CARTNEY RUN
RAMSEY RUN
PENN RUN
LAUREL RUN
BAKERS RUN
SOUTH BRANCH
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE

FIGURE 16

TWO LICK CREEK
MINE LOCATION MAP

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several occasions during the course of field work in the immediate area. However, on the single occasion that a field crew was able to determine that the discharge was mine drainage (pH $< 3.0$), the flow ceased before a sample could be collected. The drainage from this pipe feeds the small cooling pond which in turn overflows into Yellow Creek.

A total of 174 discharging sources and approximately 2,800 acres of surface mined area were investigated during this study. Table 25 presents an area breakdown in terms of total flow and total loading (lb/day) of polluting constituents discharged to receiving streams in the Two Lick Creek study area. Table 26 presents a summary of flow volumes and chemical loadings by source type for the 174 discharging sources inventoried during the study.

## POLLUTION ABATEMENT

As shown in Table 26, active mines are not a significant source of mine drainage pollution in the Two Lick Creek watershed. The overall net load from mines operating in the Two Lick Creek watershed was alkaline. With the existing pollution control laws in effect within the Commonwealth, it would not be expected the new mines developed in this watershed should add to the existing mine drainage pollution problems. At the time of inventory, an acid load of more than 18 tons per day was contributed by inactive or abandoned coal mine operations.

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## TABLE 25

### Mine drainage loadings
### by
### receiving stream

### TWO LICK CREEK

| Receiving Stream | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Two Lick Creek | 22 | 1,407 | 18,639 | 9,592 | 29,680 | 1,790 | 119 | 930 |
| Unnamed tribs to Two Lick Creek | 21 | 312 | 6,374 | 961 | 8,143 | 822 | 54 | 585 |
| Yellow Creek | 15 | 1,066 | 495 | 3,563 | 4,496 | 83 | 10 | 147 |
| Unnamed tribs to Yellow Creek | 13 | 160 | 2,443 | 434 | 2,953 | 290 | 16 | 233 |
| North Branch Two Lick Creek | 18 | 1,400 | 686 | 5,297 | 6,346 | 69 | 19 | 56 |
| Unnamed tribs to North Branch Two Lick Creek | 7 | 241 | 647 | 773 | 1,420 | 22 | 5 | 46 |
| Buck Run | 10 | 392 | 1,192 | 1,309 | 2,508 | 143 | 16 | 76 |
| Unnamed tribs to Buck Run | 4 | 74 | 243 | 203 | 514 | 11 | 7 | 15 |
| Ferrier Run | 2 | 18 | 16 | 18 | 33 | 1 | 0 | 1 |
| Unnamed tribs to Ferrier Run | 1 | 3 | 8 | 11 | 10 | 0 | 0 | 0 |
| Dixon Run | 9 | 285 | 169 | 800 | 824 | 3 | 1 | 7 |
| Unnamed tribs to Dixon Run | 14 | 258 | 432 | 1,036 | 1,473 | 72 | 9 | 24 |

TABLE 25 (Continued)

| Receiving Stream | No. of Sources | Total Discharges (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Leonard Run | 8 | 131 | 99 | 793 | 814 | 3 | 4 | 8 |
| Unnamed tribs to Leonard Run | 2 | 32 | 8 | 52 | 49 | 2 | 0 | 1 |
| Penn Run | 3 | 362 | -505 | 1,817 | 1,669 | 128 | 8 | 14 |
| Unnamed tribs. to Penn Run | 3 | 21 | 20 | 62 | 90 | 1 | 2 | 1 |
| Ramsey Run | 1 | 8 | -2 | 6 | 4 | 0 | 0 | 0 |
| Allen Run | 2 | 107 | 24 | 106 | 101 | 0 | 2 | 1 |
| Tearing Run | 6 | 523 | 3,749 | 2,054 | 6,858 | 398 | 20 | 176 |
| Unnamed tribs to Tearing Run | 13 | 302 | 1,908 | 695 | 2,604 | 185 | 12 | 94 |
| TOTALS | 174 | 7,102 | 36,645 | 29,582 | 70,589 | 4,023 | 304 | 2,415 |

## TABLE 26

### Mine drainage loadings
### by
### source type

### TWO LICK CREEK

| Source Type | No. of Sources | Total Discharges (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Drift Mines (abandoned) | 71 | 4,280 | 15,504 | 16,589 | 33,718 | 1,958 | 113 | 877 |
| Drift Mines (active) | 6 | 562 | -508 | 3,404 | 3,887 | 138 | 13 | 15 |
| Strip Mines (abandoned) | 42 | 778 | 2,607 | 3,187 | 5,669 | 224 | 55 | 138 |
| Strip Mines (active) | 1 | -1 | -1 | 2 | 2 | 0 | 0 | 0 |
| Combination Mines (abandoned) | 28 | 715 | 3,676 | 2,428 | 6,078 | 444 | 27 | 296 |
| Shaft Mines (abandoned) | 2 | 350 | 8,117 | 2,996 | 11,751 | 364 | 46 | 397 |
| Refuse Piles (abandoned) | 20 | 296 | 7,195 | 871 | 8,877 | 885 | 48 | 667 |
| Gas Wells (inactive) | 2 | 22 | 11 | 50 | 52 | 7 | 0 | 0 |
| Coal Outcrop | 2 | 98 | 44 | 55 | 555 | 3 | 2 | 25 |
| TOTALS | 174 | 7,102 | 36,645 | 29,582 | 70,589 | 4,023 | 304 | 2,415 |

Based on the initial field survey sampling program, 12 of the total 174 discharging sites contributed nearly 80 percent of the total acid load measured in the study area. These sources included six drift mines, three combination surface-underground mines, two coal refuse areas, and one shaft mine. The combined acid load discharged by these 12 sites was 29,114 lb/day.

Several of the principal sources represent only the major discharge points within a mined area or complex which may contain several additional sources which contribute less significant acid loads. In such cases, abatement or reduction of the acid loads emanating from these sources of lesser magnitude would be expected coincident with abatement of the major source site.

Any initial consideration of a mine drainage abatement program in Two Lick Creek should include the 12 sources mentioned above. Irrespective of hydrologic conditions, these sites would be expected to contribute significant acid discharges. Detailed engineering studies and mine effluent sampling, conducted during an entire water year, would more accurately characterize the relative contribution of each source. Such long-term repetitive water quality determinations may necessitate the consideration of additional major sources located elsewhere in the watershed.

The 12 principal sources listed in Table 27 provide a relative indication as to where the major mine drainage problems occur in the Two Lick Creek watershed. Until such a time when additional

# TABLE 27

## Principal mine drainage sources

## TWO LICK CREEK

| Mine No. | Type of Source | Flow (gpm) | pH | Specific Conductance | Acidity mg/1 | Acidity lb/day | Receiving Stream |
|---|---|---|---|---|---|---|---|
| 1262 | Combination Mine | 12 | 3.0 | 6,000 | 6,500 | 936 | Unnamed tributary to Yellow Creek |
| 1263 | Combination Mine | 25 | 2.9 | 4,000 | 2,700 | 810 | Unnamed tributary to Yellow Creek |
| 4159 | Combination Mine | 46 | 2.5 | 2,400 | 1,115 | 615 | Buck Run |
| 4165 | Drift Mine | 310 | 2.9 | 2,500 | 880 | 3,274 | Two Lick Creek |
| 4166 | Drift Mine | 50 | 2.5 | 4,600 | 4,400 | 2,664 | Two Lick Creek |
| 4704 | Drift Mine | 105 | 3.7 | 2,700 | 875 | 1,103 | Two Lick Creek |
| 4710 | Refuse Pile | 9 | 3.9 | 22,000 | 45,700 | 4,936 | Unnamed tributary to Two Lick Creek |
| 4728 | Drift Mine | 220 | 3.7 | 3,100 | 1,040 | 2,746 | Two Lick Creek |
| 4769 | Drift Mine | 90 | 2.1 | 3,000 | 1,660 | 1,793 | Tearing Run |
| 4771 | Drift Mine | 380 | 2.7 | 1,500 | 390 | 1,778 | Tearing Run |
| 4791 | Shaft Mine | 320 | 3.8 | 3,600 | 2,060 | 7,910 | Two Lick Creek |
| 5006 | Refuse Pile | 3 | 2.1 | >8,000 | 15,250 | 549 | Yellow Creek |
|  | TOTAL | 1,570 |  |  |  | 29,114 |  |

study can provide a more detailed assessment of the problem, these 12 sources can effectively serve as the first phase or priority in a program of drainage source abatement in the Two Lick Creek watershed. Once drainage control has been established at the principal source sites, the abatement program could be expanded to include additional discharge points of lesser magnitude.

The following is a description of the twelve principal sources. The locations of these mine sites are shown in Figure 17.

## PRINCIPAL SOURCES

### Mine No. 1262

This combination surface underground mine is located on an unnamed tributary to Yellow Creek. The 12 gpm effluent represents cumulative seepage from the base of strip mine spoil piles. This surface activity has destroyed or covered older underground mine entries. Refuse from an underground mine located elsewhere in the vicinity has also been dumped in the strip cut. One section of the disturbed area was also used as a sanitary landfill. The acid load was 936 lb/day. An additional drainage source (No. 1261), from this same mined area, contributed an acid load of 312 lb/day.

### Mine No. 1263

Mine No. 1263 discharged an acid load of 810 lb/day. The drift opening has been sealed and the drainage emerges from a trap device at the base of the seal. The area directly in front of the openings

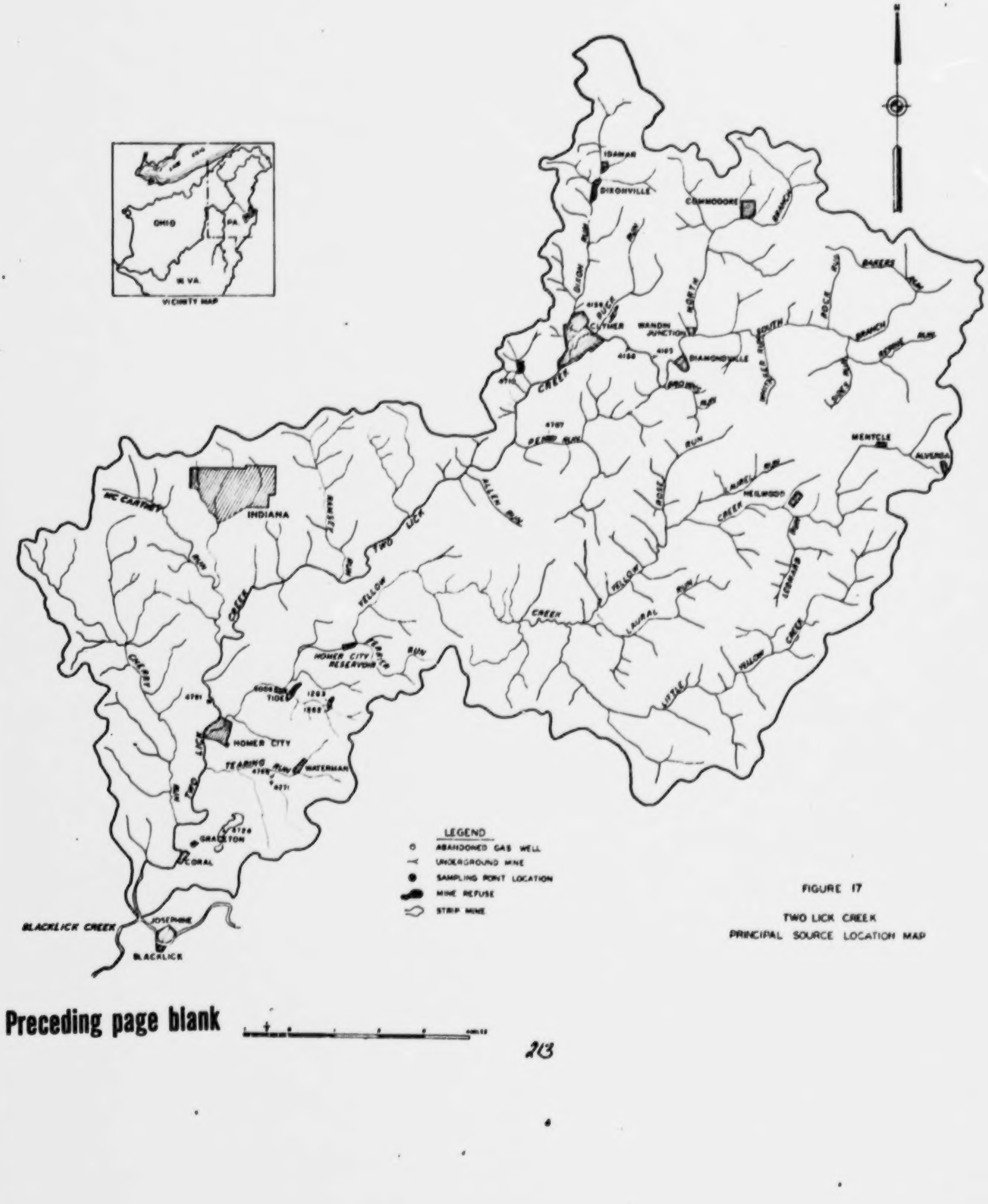
VICINITY MAP
OHIO
PA.
W. VA.
IDAMAR
DIXONVILLE
COMMODORE
BRANCH
BAKERS
RUN
ROCK
RUN
DIXON
RUN
NORTH
SOUTH
BRANCH
CLYMER
WANDIN JUNCTION
DIAMONDVILLE
CREEK
PENN RUN
RUN
ROSE
MENTCLE
ALVERDA
HEILWOOD
CREEK
LEONARD
INDIANA
MC CARTNEY
RUN
TWO LICK
ALLEN RUN
YELLOW
CREEK
YELLOW
LAURAL
RUN
LITTLE
YELLOW
CREEK
CHERRY
CREEK
HOMER CITY RESERVOIR
RUN
TIDE
HOMER CITY
TEARING RUN
WATERMAN
TWO LICK
RUN
GRACETON
CORAL
JOSEPHINE
BLACKLICK CREEK
BLACKLICK
LEGEND
○ ABANDONED GAS WELL
UNDERGROUND MINE
● SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE
MILES

FIGURE 17

TWO LICK CREEK
PRINCIPAL SOURCE LOCATION MAP

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appears to have been surface mined and then Mine No. 1263 was developed in the base of the highwall.

## Mine No. 4159

The 46 gpm effluent from this mine drains directly from an open drift mouth developed in the base of a strip mine highwall. At least six additional openings were visible along the length of this surface mine. The acid load from Mine No. 4159 was 615 lb/day. Other discharges from this same mine contributed an additional acid load of 94 lb/day (No.'s 4155 and 4156).

## Mine No. 4165

This mine is located on the opposite bank of Two Lick Creek directly across from the now abandoned Cherry Hill No. 3 Mine. A large refuse pile is also associated with Mine No. 4165. One opening to this mine was dry while the other discharged a 310 gpm effluent which carried an acid load of 3,274 lb/day.

## Mine No. 4166

This mine is located on the south side of Route 223 approximately two miles east of Clymer. (Near the Clymer Fire Tower). The opening is approximately 90 vertical feet above the roadway. The opening had been sealed at one time but the 50 gpm effluent has since broken through the adjacent hillside about 15 feet from the seal. The acid load carried to Two Lick Creek was 2,664 lb/day.

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**Mine No. 4704**

Mine No. 4704 is a drift opening located at the tip of a contour surface mine extending along main stem Two Lick Creek just downstream from the community of Clymer. This opening is one of several in the immediate area associated with the abandoned Cherry Hill No. 1 Mine. The portal to Mine No. 4704 has slumped and the 105 gpm effluent discharges via pipe extending from the interior portion of the mine. The effluent is channeled to two settling ponds and then overflows to Two Lick Creek. Treatment facilities have been operative at this site during the past. There were numerous bags of unused and spoiled lime remaining at the site. However, all physical structures associated with this facility have since been removed. The acid load contributed by this source was 1,103 lb/day.

**Site No. 4710**

A large underground mine complex was at one time operative on an unnamed northbank tributary to Two Lick Creek approximately one mile downstream from Clymer. Openings to this mine were located on both sides of Route 286. Although these openings were dry, the large refuse pile associated with this mine was responsible for the discharge of a very highly mineralized effluent. The 9 gpm effluent, representing cumulative seepage from the base of the pile, exhibited an acidity concentration of 45,700 mg/l. The acid load was 4,936 lb/day. Two additional seeps from the same refuse area contributed a combined additional acid load of 479 lb/day (No.'s 4711, 4712).

### Mine No. 4728

This mine is located in an area which has been mined both by surface and underground mining methods. At this particular site, a slumped drift mine was located along the hillside. Approximately 50 feet below this portal, three separate effluents emerged from the hillside. The combined flow of these effluents was 220 gpm and the resultant acid load was 2,746 lb/day. Seepage from the strip mine spoil piles, refuse areas, and other mine openings contributed an additional acid load of more than 400 lb/day.

### Mine No. 4769

Mine No. 4769 is located on Tearing Run near the community of Waterman. This opening is one of five in the immediate area, all of which are probably associated with the same mine operation. The opening had been sealed at one time but this seal has fallen into disrepair and the 90 gpm effluent emerges directly from the seal. The acid load carried to Tearing Run was 1,793 lb/day.

### Mine No. 4771.

This mine is located in the same immediate area as Mine No. 4769 described above. However, the openings are on the opposite side of Tearing Run near several old mine buildings. The two' openings at Mine No. 4771 are about 20 feet apart and contributed a combined discharge of 380 gpm. The acid load was 1,778 lb/day.

**Mine No. 4791**

The origin of this source is actually a bore hole located on the bank of Two Lick Creek near Risinger School in Homer City. It appears that a shaft or slope entry has been sealed at this site. A wooden drainage pipe emerges from the bank of the stream approximately 20 feet from the sealed entry. The discharge was 320 gpm which carried an acid load of 7,910 lb/day. This site represents the largest single source of mine drainage pollution in the entire Two Lick Creek drainage area. A local resident stated that this discharge emanated from the old Tide Mine.

**Site No. 5006**

No. 5006 represents cumulative seepage from the base of a large refuse pile near the community of Tide. This effluent represents only one of innumerable and generally immeasurable seeps which originate at the base of this gob disposal area. These seepage areas occurred along most of the 0.6 mile length of the pile. The acidity concentration of this effluent was more than 15,000 mg/l with a resultant acid load of 549 lb/day.

# LITTLE CONEMAUGH RIVER
# MINE DRAINAGE INVENTORY

## LITTLE CONEMAUGH RIVER

## SUMMARY AND CONCLUSIONS

1. The Little Conemaugh River drains an area of 188 square miles in Cambria County. The entire length of the main stem between the headwaters and the community of Johnstown is severely polluted as a result of coal mine discharges. Some of the largest discharges in the Kiskiminetas River basin are located in the vicinity of Portage.

2. A total of 99 discharging sources and approximately 1,400 acres of surface mined area were investigated in the study area. Discharges from the coal mine sources ranged from one to 3,784 gpm and totalled more than 29 million gallons per day (mgd). The total net acid load discharged by the 99 sources was 153,570 lb/day.

3. At the time of survey, there were four active discharging mines in the Little Conemaugh River basin. Two were surface mines and the other two were drift mines. The largest of the underground operations was the brookdale #77 Mine of the Bethlehem Mine Corporation. At the time of inspection, this mine produced an untreated effluent which carried an acid load of 1,415 lb/day. According to the Commonwealth, this mine now provides adequate treatment of its mine discharge.

4. Abandoned drift mines and shaft mines were the major source of mine drainage discharge in the Little Conemaugh River basin. These two source types contributed an acid load exceeding 70.5 tons per day.

This represented over 90 percent of the acid load discharged by all 99 sources in the basin.

5. A total of seven principal sources of mine drainage discharge were located in the study area. These sources included five shaft mines and two drift mines. These sources discharged a total net acid load of 121,344 lb/day. This represents about 80 percent of the total source acid load discharged by all 99 sources.

## DESCRIPTION OF AREA

The Little Conemaugh River rises south of Cresson, Pennsylvania in Cambria County. The river flows generally southwest through the communities of Lilly, Portage, South Fork, and joins Stony Creek at Johnstown to form the Conemaugh River. The principal tributary to the Little Conemaugh River is the South Fork of the Little Conemaugh River. The South Fork drains 62 square miles of the total 188 square mile drainage area of the Little Conemaugh River.

Coal mine operations are extensive in all areas of the watershed. A number of large abandoned shaft mines are located in this study area, particularly in the vicinity of Portage. The bore hole discharges from these shaft mines contribute some of the largest acid loads encountered in the entire Kiskiminetas River drainage area. At the time of the mine drainage inventory, active underground operations were limited to the large Cambria No. 33 slope and the Brockdale No. 77 Mines of Bethlehem Mines Corporation. At the time of the survey, several one or two man "donkey mines" were also in operation. Several active surface mines were inspected and it appeared that additional areas were available for the expansion of these operations.

## STREAM WATER QUALITY

The headwaters area of the Little Conemaugh River was immediately degraded by discharges from abandoned surface and underground coal mine operations. The polluted condition of the river is further degraded by massive acid discharges in the vicinity of Portage. This degraded water quality condition persists along the downstream reach of the river to the community of South Fork.

The drainage area of South Fork Little Conemaugh River is unaffected by mine drainage above the community of Lloydell. Below this community, shaft mine discharges located along the main stem and tributaries of the South Fork were responsible for the grossly polluted condition found along the entire downstream reach of the South Fork.

Below the community of South Fork, the water quality of the Little Conemaugh River does not improve along its downstream reach to the confluence with Stony Creek at Johnstown. There were numerous sources of significant mine drainage discharge in this area.

During the course of the field study, several stream locations were sampled for chemical analysis. (Table 28). These stations were selected to measure the cumulative effects of mine drainage in the study area. A summary of this data is presented in Table 29. The locations of these sampling points are shown in Figure 18.

## SOURCES OF MINE DRAINAGE

An estimated 230 mining sites and approximately 1,400 acres of surface mined area were examined during this 1968 study. Samples for

## TABLE 28

### Stream water quality sampling stations

### LITTLE CONEMAUGH RIVER

| Station No. | Sampling Period | Stream | Location |
|---|---|---|---|
| 5261 | July, December,1968<br>January 1969 | Little Conemaugh River | USGS gage @ East Conemaugh |
| 5205 | July, December, 1968 | Little Conemaugh River | Just below mouth of South Fork |
| 5202 | June, July, December 1968 | South Fork | Near mouth |
| 5203 | June, July, December 1968 | Little Conemaugh River | Just above mouth of South Fork |
| 5291 | July, December 1968<br>January 1969 | Otto Run | Near mouth |

TABLE 29

Stream water quality data

LITTLE CONEMAUGH RIVER

| Station No. | Sampling Date | Flow (gpm) | pH | Specific Conductance | Total Acidity mg/1 | Total Acidity lb/day | Hardness mg/1 | Hardness lb/day | Sulfate mg/1 | Sulfate lb/day | Total Iron mg/1 | Total Iron lb/day | Manganese mg/1 | Manganese lb/day | Aluminum mg/1 | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5261 | July 9, 1968 | 22,500 | 2.9 | 2900 | 435 | 117,450 | 420 | 113,400 | 770 | 207,900 | 43.3 | 11,691 | 6.9 | 1,863 | 17.9 | 4,833 |
| " | Dec. 3, 1968 | 159,300 | 4.7 | 650 | 195 | 372,762 | 117 | 223,657 | 355 | 678,618 | 16.6 | 31,733 | 2.0 | 3,823 | 4.1 | 7,838 |
| " | Jan. 3, 1969 | 116,750 | --- | --- | 57 | 78,489 | 29 | 39,933 | 10 | 13,770 | 2.2 | 3,029 | 0.1 | 138 | 1.8 | 3,479 |
| 5205 | July 3, 1968 | 27,832 | 3.0 | 1250 | 290 | 96,855 | 358 | 119,566 | 825 | 275,537 | 9.2 | 3,073 | 4.3 | 1,436 | 11.6 | 3,874 |
| " | July 11, 1968 | 36,854 | 3.2 | 2100 | 305 | 134,886 | 1,050 | 464,360 | 825 | 364,855 | 65.6 | 29,011 | 4.4 | 1,946 | 12.5 | 5,528 |
|  | Dec. 3, 1968 | 113,022 | 4.5 | 575 | 145 | 196,658 | 119 | 161,395 | 270 | 366,191 | 22.4 | 30,380 | 1.7 | 2,306 | 5.4 | 7,324 |
| 5202 | June 27, 1968 | 22,970 | 3.3 | 1250 | 345 | 95,096 | 352 | 97,026 | 795 | 219,134 | 56.5 | 15,574 | 4.5 | 1,240 | 10.2 | 2,812 |
| " | July 9, 1968 | 16,690 | 3.3 | 2000 | 365 | 73,102 | 392 | 78,510 | 825 | 165,231 | 72.5 | 14,520 | 5.2 | 1,041 | 11.1 | 2,223 |
| " | Dec. 3, 1968 | 54,607 | 5.0 | 650 | 195 | 127,780 | 134 | 87,808 | 305 | 199,861 | 36.4 | 23,852 | 1.8 | 1,180 | 5.6 | 3,670 |
| 5203 | June 27, 1968 | 27,450 | 3.2 | 1075 | 210 | 69,174 | 478 | 91,573 | 620 | 204,228 | 18.3 | 6,028 | 3.1 | 1,021 | 9.3 | 3,063 |
| " | July 10 1968 | 14,463 | 3.1 | 1750 | 250 | 43,389 | 406 | 70,464 | 740 | 128,431 | 15.9 | 2,760 | 3.9 | 677 | 12.3 | 2,135 |
| " | Dec. 3, 1968 | 58,415 | 5.7 | 550 | 160 | 112,157 | 114 | 79,912 | 235 | 164,730 | 11.4 | 7,991 | 1.7 | 1,192 | 4.4 | 3,084 |
| 5291 | July 11, 1968 | 1,895 | 3.5 | 900 | 170 | 3,866 | 100 | 2,274 | 170 | 3,866 | 2.2 | 50 | 2.3 | 52 | 8.9 | 202 |
| " | Dec. 3, 1968 | 7,342 | 4.5 | 300 | 160 | 14,097 | 39 | 3,436 | 75 | 6,608 | 2.8 | 247 | 0.9 | 79 | 4.1 | 361 |
| " | Jan. 3, 1969 | 3,000 | --- | --- | 77 | 2,772 | 38 | 1,368 | 20 | 720 | 2.1 | 76 | 0.4 | 14 | 2.0 | 72 |

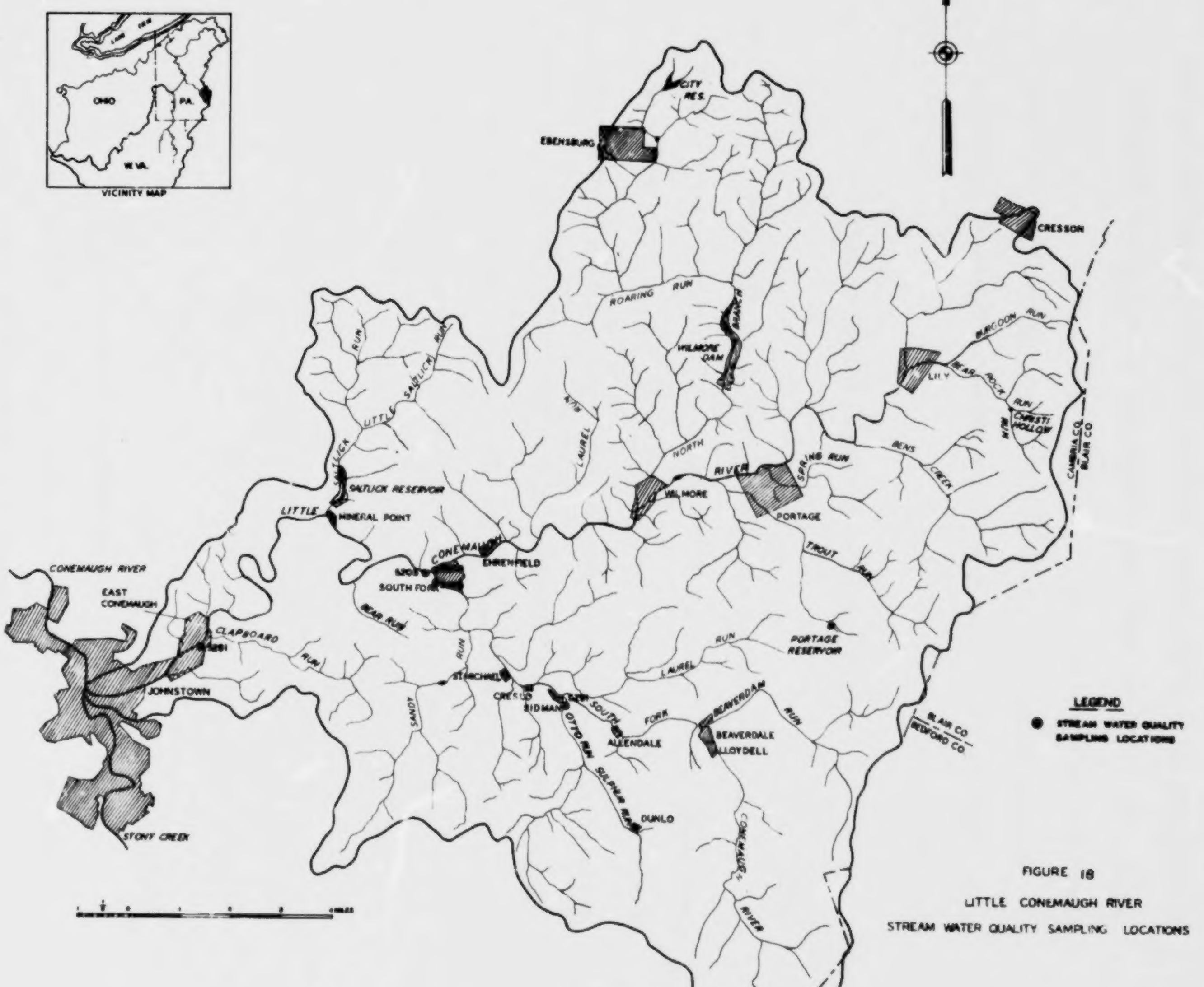

VICINITY MAP
LAKE ERIE
OHIO
PA.
W. VA.
CITY RES.
EBENSBURG
CRESSON
ROARING RUN
BRANCH
WILMORE DAM
BURGOON RUN
LILY
BEAR ROCK RUN
CHRISTI HOLLOW RUN
CAMBRIA CO
BLAIR CO
BENS CREEK
LITTLE SAUTUCK RUN
RUN
LAUREL RUN
NORTH
RIVER
SPRING RUN
WILMORE
PORTAGE
TROUT RUN
SALTLICK RESERVOIR
LITTLE
MINERAL POINT
CONEMAUGH
EHRENFIELD
SOUTH FORK
BEAR RUN
CONEMAUGH RIVER
EAST CONEMAUGH
CLAPBOARD RUN
JOHNSTOWN
STONY CREEK
SANDY RUN
ST. MICHAEL
CRESLO
SIDMAN
OTTO RUN
SOUTH FORK
ALLENDALE
SULPHUR RUN
DUNLO
LAUREL RUN
PORTAGE RESERVOIR
BEAVERDAM RUN
BEAVERDALE
LLOYDELL
CONEMAUGH RIVER
BLAIR CO
BEDFORD CO
CAMBRIA CO
SOMERSET CO
MILES
LEGEND
● STREAM WATER QUALITY SAMPLING LOCATIONS

FIGURE 18

LITTLE CONEMAUGH RIVER

STREAM WATER QUALITY SAMPLING LOCATIONS

chemical analysis were collected from 99 sources discharging at the time of survey. The total effluent from these sources was more than 20 thousand gallons per minute (gpm) or 29.4 million gallons per day (mgd). The total net acid load discharged to the Little Conemaugh River was 76.8 tons per day.

A description of the mine drainage sources follows. All mine site locations in this study area are shown in Figure 19 following the source description section.

## LITTLE CONEMAUGH RIVER, ABOVE SOUTH FORK

### Headwaters Area

No coal mine operations were located along the short reach of the main stem Little Conemaugh River between the headwater community of Cresson and downstream community of Lilly. However, several mine drainage discharges were located on an unnamed tributary which enters the main stem in this headwater area. The most significant of these discharges resulted from Mine No. 5061. At this site, a 65 gpm effluent from the base of a slumped drift mine opening discharged an acid load of 374 lb/day to the receiving tributary. The three remaining discharges (Mine No.'s 5060, 5062, 5063) contributed a combined acid load of 158 lb/day. An open shaft mine was also found in this area; however, it contributed no discharge.

### Burgoon Run, Bear Rock Run

A total of eight drift openings were located along the banks of Burgoon Run. At the time of inspection, all of these mines were dry and as a result, the tributary was unaffected by mine drainage. The pH and conductivity measured near the mouth of Burgoon Run were 6.5 and 310, respectively.

With the exception of the very headwaters area, mine operations were distributed throughout the entire Bear Rock Run drainage area. An active surface mine was located on Christie Hollow, a tributary to Bear Rock Run. Settling ponds had been constructed below this operation; however, the mine was dry. In addition to this surface mine, three drift mines were in operation during the study. These were the Standard No. 1 and No. 2 Mines of the Lilly Mining Company and the mine operated by the New Hope Mining Company. These mines were small two-four man operations which employed donkeys for coal car haulage. All of these mines were dry.

The most significant source of abandoned mine discharge in the Bear Rock Run drainage area resulted from Mine No. 5058. At this surface mine, a small tributary (hillside spring) had been diverted through a partially reclaimed surface mine. This small tributary carried an acid load of 149 lb/day below the surface mined area near the point where the tributary entered Bear Rock Run.

## Little Conemaugh River

Several discharges from abandoned underground drift mines were located along the main stem Little Conemaugh River below the community of Lilly. These mines include No.'s 5116, 5117, and 5118. The combined acid load discharged by these mines was 147 lb/day.

A series of bore hole discharges were located along the banks of the Little Conemaugh River in the general vicinity of Portage.

The first of these bore hole discharges was located along the north bank of the river at site No. 5114, northeast of Portage. A total effluent of 1,400 gpm was measured at this site. The acid load was nearly 6 tons per day.

The second site (No. 5115) was found along the south bank of the river just north of Portage. Two side-by-side bore holes at this location discharged a combined effluent of 563 gpm. The acid load was 3,783 lb/day.

The last bore hole discharges in this area were located along the north bank of the river about 0.8 mile west of No. 5115. These were No.'s 5008 and 5129. An effluent of 278 gpm discharged from No. 5008. The effluent comes to the surface via pipe casing which once carried power lines to the underground mine. The discharge from No. 5129 was 3,784 gpm. The acid loads from No.'s 5008 and 5129 were 1,601 lb/day and 22,704 lb/day, respectively.

All of the bore hole discharges mentioned above were reported as draining the large abandoned Sonman Mine. The main portal to this mine (slope entry) is located on Spring Run. There was no discharge at the portal. The preparation plant associated with the Sonman Mine was in use by surface mine operators for crushing and screening of coal before loading into rail cars. It appears likely that the Sonman Mine may be interconnected with other shaft and/or slope mines in the vicinity of Portage.

## Bens Creek

Four surface mines and eight drift mines were located within the Bens Creek drainage area. The only active site was a surface mine in the upper reaches of the tributary. The major sources of mine drainage discharge were Mine No.'s 5119 and 5120. Mine No. 5119 contributed an effluent of 10 gpm from the base of the slumped drift opening. The acid load was 60 lb/day. The effluent at No. 5120 discharged from a drainway below several drift mine openings. The 32 gpm effluent contributed an acid load of 159 lb/day.

## Spring Run

This small tributary drains an area northeast of the community of Portage. Mine No.'s 5123 and 5124 discharged the major portion of the total acid load received by Spring Run. These loads were 119 lb/day and 21 lb/day, respectively. A small seepage area was also located at the base of the refuse pile from the abandoned Sonman Mine. This source (No. 5069) contributed an acid load of 18 lb/day.

## Trout Run

The ten square mile drainage area of Trout Run has been mined extensively in all portions of the watershed below the Portage Reservoir. There were no coal mine operations above the reservoir.

A total of three effluents (No.'s 5064, 5065, 5066) were located along the base of a surface mine in the upstream area of Trout Run. The combined acid load discharged by these sources was 766 lb/day. The major portion (586 lb/day) of this load was contributed by No. 5064.

Several other strip mines and drift mine openings associated with these surface mines were located in this area; however, they were dry.

An active drift mine, operated by the Lonely Coal Company, was in operation along the north side of Trout Run. This mine operated in a small coal reserve abandoned by prior mining operations. There was no discharge from the Lonely Mine.

Mine No. 5159 is an abandoned drift mine driven under the bed of State Route 164, which parallels a portion of Trout Run. There were two openings to the mine, both of which were partially open at the time of inspection. The airway was dry; however, a discharge of 62 gpm was measured at the mouth of the mine portal. The acid load contributed by Mine No. 5159 was 804 lb/day.

The large abandoned Miller Shaft Mine is located along the lower reaches of Trout Run. A slope opening to this mine has been driven under the bed of State Route 164. This opening was dry. A second opening was located in the vicinity of the tipple; however, it was also dry. Approximately 150 yards below the tipple, a bore hole discharged an artesian effluent of 2,282 gpm. The acid load carried by this effluent was more than 5.5 tons per day. Five separate refuse dumps are located along the banks of Trout Run in the vicinity of the Miller Shaft. These waste dumps undoubtedly contributed to the degraded water quality of the stream.

## North Branch

The Bethlehem No. 33 Slope Mine was the only coal mine operation located on this tributary to the Little Conemaugh River. The drainage from this mine is pumped to a treatment facility on the South Branch of Blacklick Creek below the community of Revloc. This discharge is discussed in the Blacklick Creek Sub-basin report.

A discharge was sampled near the mouth of North Branch. However, a gas well was responsible for this effluent. The discharge carried a net alkaline load of 149 lb/day (No. 5113).

Little Conemaugh River

One of the most extensive coal mine complexes in the entire Kiskiminetas River basin was located in the community of Wilmore. This was the Maryland No. 2 Mine of the Berwind White Coal Company. In addition to the numerous mine buildings, preparation facilities, etc., a coal fired steam generating plant was associated with the Maryland mine. Both main shaft entries to the mine have been sealed. The only sources of discharge resulted from the waste dumps associated with the Maryland complex. Three of these effluents (No.'s 5070, 5161, and 5162) contributed a combined acid load of 461 lb/day.

A series of abandoned drift mine openings were located along the north bank of the Little Conemaugh River in the vicinity of Ehrenfield. These were Mine No.'s 5108, 5109, and 5112 and discharged acid loads of 243 lb/day, 338 lb/day, and 2,646 lb/day, respectively. A discharge of 882 gpm was measured at Mine No. 5112.

The active Ehrenfield No. 8 mine operated by the Pennsylvania Coal and Coke Company, is located at Ehrenfield. The only discharge directly attributable to this mine was a four gpm effluent from the air fan. There are numerous acid discharges in the immediate area; however, the Commonwealth does not consider Ehrenfield No. 8 responsible for these discharges. These other discharges were confined to mines in coal seams below the active operation. These included Mine No.'s 5105, 5106, and 5107 and other discharge points near the east end of the community of Ehrenfield. Mine seals have been constructed at five discharge points in the immediate Ehrenfield area. These include Mine No.'s 5102, 5103, 5110, and No.'s 5105, and 5107 mentioned earlier.

Stream sampling was conducted on the Little Conemaugh River just above the confluence with the South Fork Little Conemaugh River. During the sampling period, (Table 28) the acid load carried by the river ranged from 22 tons per day to 56 tons per day (Table 29).

## SOUTH FORK LITTLE CONEMAUGH RIVER

### Headwaters Area

The Beaverdale water supply reservoir is located near the headwaters of the South Fork Little Conemaugh River. Coal mine operations were totally absent in the headwaters area which drain to the reservoir.

Several surface mines were located on tributaries which drain to the river below the reservoir. However, there were no significant mine effluents discharged to the South Fork Little Conemaugh River above the community of Beaverdale.

### South Fork Little Conemaugh River, Beaverdale to Sidman

A bore hole discharge of 289 gpm was received by the South Fork in the community of Beaverdale. All evidence of the shaft or slope mine entry has been destroyed. Considerable amounts of mine refuse are scattered about the immediate area. The acid load carried by this effluent (No. 5260) was 2,220 lb/day.

Mine No.'s 5100 and 5127 discharged significant acid loads to the South Fork approximately 1.5 miles below Beaverdale. Mine No. 5100 contributed a discharge of 1,408 gpm and carried an acid load of more than 6 tons per day. The effluent from this mine drains from the original concrete portal which is still intact. The effluent from No. 5127 represents cumulative seepage from the large refuse pile associated with Mine No. 5100. The acid load contributed by the refuse area drainage was 1,176 lb/day.

There were no additional mine discharges below No.'s 5100 and 5127 and the downstream community of Sidman.

## Otto Run

Otto Run and its principal tributary, Sulphur Creek, joins the South Fork Little Conemaugh River in the community of Sidman. All sources of mine drainage were located on Sulphur Creek. However, due to the severity of these discharges, Otto Run is similarly affected along its entire downstream length below the confluence with Sulphur Creek.

The first sources of mine drainage discharge, Mine No.'s 5141 and 5142, are located at the very headwaters of Sulphur Creek. The combined acid load discharged by these two surface mines was 67 lb/day. Several additional surface mines and two slope mine openings were found in the headwater areas but they were dry.

Mine No. 5140, located in the community of Dunlo, discharged an acid load of 478 lb/day to Sulphur Creek. The portal to this drift mine was dry; however, a 40 gpm effluent was discharged via the airway.

The largest mine discharge on Sulphur Creek was located about 0.5 mile above the confluence with Otto Run. This effluent (No. 5154) discharged by means of a bore hole on the north bank of Sulphur Creek. The measured effluent was 1,730 gpm which carried an acid load of 6,228 lb/day. A local surface mine operator reported this bore hole drained a series of interconnected shaft and slope mines. These mines included the Dunlo, Yellow Creek, and Henrietta Mines.

Stream sampling was conducted at the mouth of Otto Run coincident with the mine drainage inventory in 1968. During this period, (Table 28) Otto Run at the mouth carried an acid load ranging from two to seven tons per day (Table 29).

## South Fork Little Conemaugh River, Sidman to South Fork

Only two other areas of coal mining activity were located on the South Fork Little Conemaugh River between the community of Sidman and the downstream community of South Fork.

The St. Michael Shaft Mine was located on a small unnamed tributary which enters the South Fork near the communities of St. Michael and Creslo. Both shaft entries to this mine have been filled. A large diameter pipe is located near the shafts on the bank of the unnamed tributary mentioned above. The effluent from this bore hole pipe was 3,272 gpm which carried an acid load of nearly 24 tons per day. An additional acid load of 1,440 lb/day was contributed by drainage from the extensive mine waste dumps associated with the St. Michael Mine.

A large mine refuse dump covering many acres is located along the South Bank of the South Fork just above the confluence with the Little Conemaugh River. A total of seven drift mine openings were located in the vicinity of the refuse dump. Three of these mines, No.'s 5132, 5133 and 5134 are situated in such a manner that they drain to the Little Conemaugh River. Only one of the four remaining openings contributed a discharge at the time of inspection. This was Mine No. 5135 with an acid load of 464 lb/day.

Mine No.'s 5130 and 5131 are located on the north bank of the South Fork directly across from the large refuse area mentioned above. The discharges from these mines are located at the same elevation and separated by approximately 75 yards. Mine No. 5130 contributed an acid load of 9,164 lb/day and Mine No. 5131 discharged an alkaline load of 90 lb/day.

Stream sampling was conducted near the mouth of South Fork Conemaugh River coincident with the mine drainage source investigation (Table 28). During this period, the acid load carried by the river ranged from a minimum of 37 tons per day to a maximum of 64 tons per day (Table 29). Other mine drainage parameters were also excessive.

## Little Conemaugh River, South Fork to Mineral Point

The first mine discharges located on the south bank of the Little Conemaugh River below the community of South Fork were from Mine No.'s 5132, 5133 and 5134 mentioned in the preceeding section. These are all drift mines and contributed a total acid load of 661 lb/day.

A contour surface mine, approximately 2.5 miles in length, is located along the south bank of the river just downstream of the community of South Fork. Multiple coal seams have been mined along approximately one-half of the total length of this surface mine. The only point sources of drainage occurred from the base of the spoil piles. This discharge (No. 5084) contributed an acid load of 110 lb/day to Bear Run. This tributary intersects the mined area and is diverted across several hundred yards of disturbed area. At the point where Bear Run leaves the surface mine it carried an acid load of 219 lb/day. The sample of Bear Run (No. 5085) was collected above the point where the spoil pile drainage (No. 5084) enters the tributary.

A second large surface mine is located on the north bank of the Little Conemaugh River below the community of South Fork. Three discharges, representing cumulative seepage, were collected at the base of the strip mine spoil piles. The total acid load from these sources (No.'s 5089, 5090 and 5091) was 162 lb/day.

## Saltlick Run

Saltlick Run drains an area of 11.4 square miles and enters the

Little Conemaugh River in the small community of Mineral Point. A total of three underground mine discharges were located in the Saltlick drainage area. These were Mine No.'s 5092, 5093 and 5094. The acid load contributed by these discharges were 1,197 lb/day, 135 lb/day, and 496 lb/day, respectively.

Saltlick Reservoir is located near the lower end of the tributary. This reservoir is privately owned and is used as a source of industrial water supply for the steel mills in Johnstown. In order to prevent drainage inflow to the reservoir from the three sources listed above, the mine effluents are diverted around both sides of the reservoir and finally discharged to Saltlick Run below the reservoir.

## Little Conemaugh River, Mineral Point to Johnstown

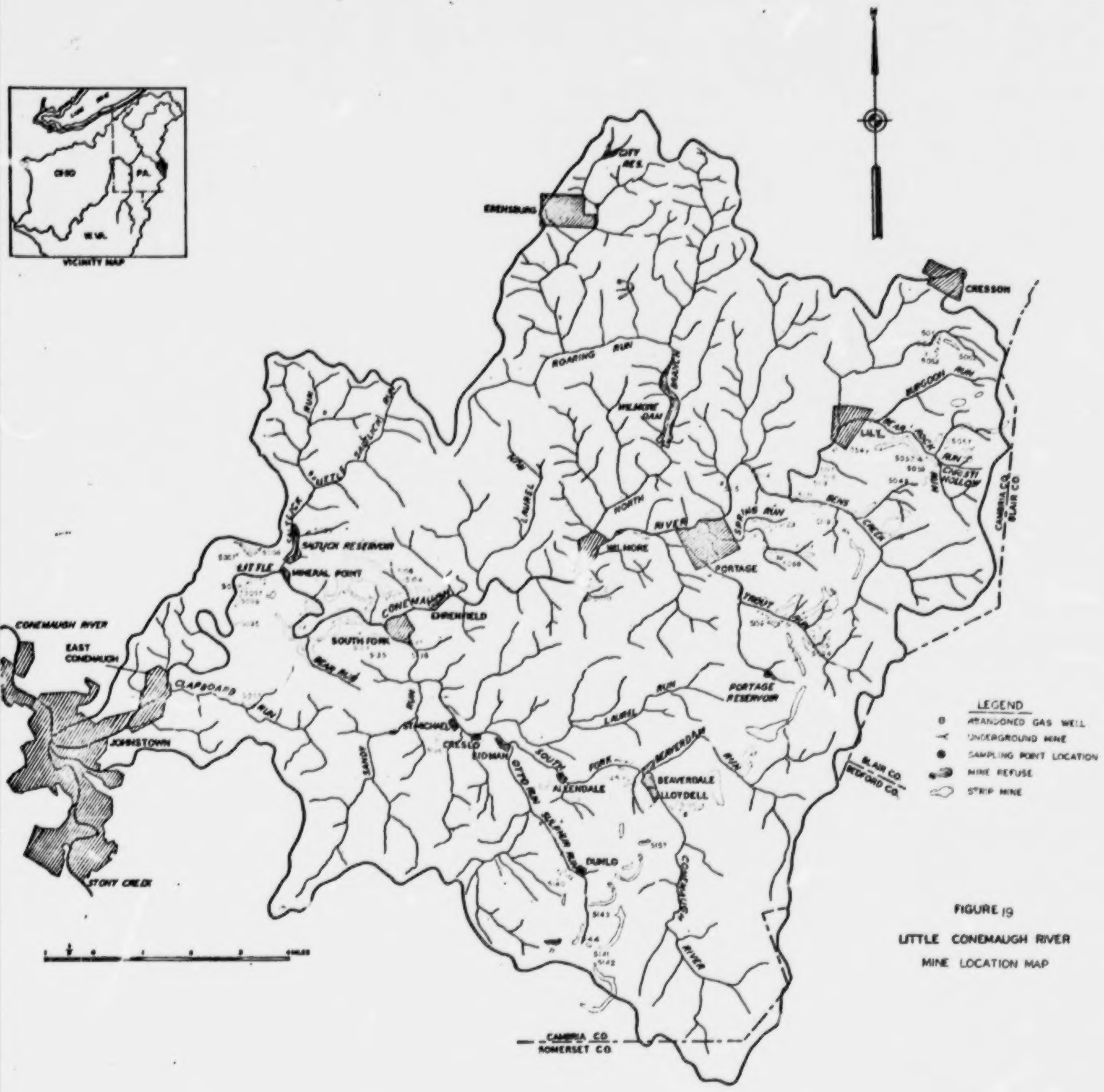
An abandoned drift mine and a large mine refuse dump are located on the north bank of the river just west of Saltlick Reservoir. Drift Mine No. 5087 discharged an alkaline effluent of 7 lb/day and the refuse area discharged an effluent which carried an acid load of 3,110 lb/day.

The active Brookdale No. 77 Mine of Bethlehem Mines Corporation is situated on the north bank of the river in the same area described above. At the time of inspection (August 1968), the Brookdale Mine discharged an acid load of 1,415 lb/day directly to the Little Conemaugh River. Treatment facilities have since been installed at this mine. According to the Pennsylvania Department of Environmental Resources, the treatment is adequate and results in an alkaline discharge with an iron concentration less than 7 mg/l.

Four significant mine discharges were located across from the Brookdale Mine on the opposite bank of the river. Each discharge drains from the same area which has been mined by both surface and underground methods. Three of the effluents (No.'s 5096, 5097 and 5099) emanate from the bases of partially open drift mines. The acid loads from these sources were 950 lb/day, 347 lb/day and 535 lb/day, respectively. The fourth discharge (No. 5098) was collected below the surface mined area. The acid load from this source was 370 lb/day.

Mine No. 5095 was the last downstream site draining directly to the south side of the Little Conemaugh River. The point of discharge probably represents an area where underground mine workings have broken through to the surface. The discharge was 60 gpm and carried an acid load of 407 lb/day.

Clapboard Run joins the Little Conemaugh River approximately 0.3 miles above (upstream) of the USGS gaging station at East Conemaugh. Mine No.'s 5256 and 5257 were the only mine operations on Clapboard Run. A total of four openings were located in the immediate area; however, only two were discharging. Both discharging openings appeared to have been sealed at one time. The acid loads discharged by No.'s 5256 and 5257 were 1,530 lb/day and 1,818 lb/day, respectively.



VICINITY MAP
OHIO
PA.
W.VA.
EBENSBURG
CITY RES.
CRESSON
ROARING RUN
WILMORE DAM
BRANCH
BURGOON RUN
LILLY
BEAR ROCK RUN
CHRISTI HOLLOW RUN
BENS CREEK
CAMBRIA CO.
BLAIR CO.
SALTLICK RUN
LITTLE SALTLICK RUN
LAUREL RUN
NORTH
RIVER
SPRING RUN
SALTLICK RESERVOIR
LITTLE
MINERAL POINT
WILMORE
PORTAGE
CONEMAUGH
EHRENFELD
TROUT RUN
CONEMAUGH RIVER
EAST CONEMAUGH
SOUTH FORK
BEAR RUN
CLAPBOARD RUN
JOHNSTOWN
ST. MICHAEL
CRESLO
SIDMAN
SANDY RUN
SOUTH FORK
PORTAGE RESERVOIR
LAUREL RUN
BEAVERDAM RUN
OTTO RUN
SULPHUR RUN
ALLENDALE
BEAVERDALE
LLOYDELL
DUNLO
STONY CREEK
CONEMAUGH RIVER
BLAIR CO.
BEDFORD CO.
CAMBRIA CO.
SOMERSET CO.
MILES
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE

FIGURE 19
LITTLE CONEMAUGH RIVER
MINE LOCATION MAP

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During the course of the field study, stream sampling was conducted on the Little Conemaugh River at the USGS gage in East Conemaugh. This stream station is below all mine drainage inflow located in the Little Conemaugh River study area. During the sampling period (Table 28) the river carried an acid load ranging from 48.5 tons per day to 98.5 tons per day (Table 29). Other mine drainage related parameters were also excessive.

A total of 99 discharging sources and approximately 1,400 acres of surface mined area were investigated during this study. Table 30 presents an area breakdown in terms of total flow and total loading (lb/day) of polluting constituents discharged to receiving streams of the Little Conemaugh River. Table 31 presents a summary of flow volumes and chemical loadings by source type for the 99 discharging sources located during the study.

## POLLUTION ABATEMENT

As shown in Table 31, abandoned shaft mines were the principal pollution sources in the Little Conemaugh River. The total acid load discharged from these shaft or slope mine sources was 109,451 lb/day. Abandoned drift mines were the secondary major source type and discharged an acid load of 32,085 lb/day.

Seven of the largest mine effluents were responsible for a large portion of the total acid load discharged by all sources in the Little Conemaugh River. These seven abandoned sources include

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Table 30

Mine drainage loadings by receiving stream
Little Conemaugh River

| Receiving Stream | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Little Conemaugh River | 27 | 8,134 | 48,257 | 69,613 | 118,987 | 17,146 | 472 | 1,308 |
| Unnamed trib. to Little Conemaugh River | 15 | 305 | 4,368 | 1,317 | 5,987 | 1,459 | 64 | 87 |
| North Branch | 1 | 45 | -149 | 79 | 346 | 0 | 0 | 0 |
| South Fork | 7 | 2,893 | 24,098 | 24,665 | 45,448 | 6,310 | 184 | 1,319 |
| Unnamed trib. to South Fork | 8 | 3,476 | 50,446 | 58,110 | 103,982 | 24,266 | 523 | 1,018 |
| Bear Rock Run | 6 | 222 | 227 | 91 | 203 | 20 | 4 | 25 |
| Unnamed trib. to Bear Rock Run | 2 | 6 | 7 | 9 | 15 | 0 | 0 | 1 |
| Christie Hollow | 2 | 19 | 11 | 5 | 8 | 4 | 0 | 0 |
| Bens Creek | 3 | 47 | 243 | 103 | 370 | 5 | 2 | 19 |
| Unnamed trib. to Bens Creek | 2 | 8 | 14 | 5 | 4 | 0 | 0 | 0 |
| Trout Run | 4 | 2,365 | 12,246 | 21,329 | 36,291 | 3,665 | 197 | 305 |
| Unnamed trib. to Trout Run | 3 | 16 | 766 | 172 | 1,024 | 8 | 58 | 38 |
| Spring Run | 3 | 116 | 158 | 213 | 381 | 7 | 1 | 6 |
| Unnamed trib. to Spring Run | 2 | 32 | 289 | 198 | 527 | 39 | 18 | 12 |
| Sulphur Creek | 6 | 1,836 | 7,073 | 3,179 | 11,968 | 1,064 | 90 | 286 |
| Unnamed trib. to Sulphur Cr. | 1 | 2 | 11 | 4 | 13 | 0 | 0 | 1 |
| Saltlick Run | 3 | 671 | 1,828 | 3,158 | 6,193 | 747 | 30 | 85 |
| Bear Run | 2 | 90 | 329 | 422 | 846 | 56 | 9 | 11 |
| Clapboard Run | 2 | 150 | 3,348 | 1,058 | 4,748 | 510 | 11 | 212 |
| TOTALS | 99 | 20,433 | 153,570 | 183,730 | 337,341 | 55,306 | 1,663 | 4,733 |

five shaft or slope mines and two drift mines. The combined acid load discharged by these sources was 121,344 lb/day, about 80 percent of the total source acid load.

Any initial consideration of a mine drainage abatement program in the Little Conemaugh River should include the seven sources mentioned above. Irrespective of hydrologic conditions, these sites would be expected to contribute significant acid discharges. Detailed engineering studies and mine effluent sampling conducted during an entire water year would more accurately characterize the relative pollution contribution of each source. Due to the magnitude of each discharge, it would be expected that, even when considered over a longer time period, each site would remain a major contributor. However, long term repetitive water quality determinations may necessitate the consideration of additional sources located elsewhere in this basin.

The seven principal sources (listed in Table 32) located during this initial survey provide a relative indication as to where the major mine drainage problems occur in the study area. Until such a time when additional study can provide a more detailed assessment of the problem, these seven sources can effectively serve as the first phase or priority in a program of drainage source abatement in the Little Conemaugh River. Once drainage control has been established at the principal source sites, the abatement program could be expanded to include additional significant discharge points.

## Table 31

### Mine drainage loadings by source type

### Little Conemaugh River

| Source Type | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Drift Mines (abandoned) | 43 | 4,651 | 32,085 | 35,168 | 64,801 | 7,056 | 232 | 1,724 |
| Drift Mines (active) | 2 | 367 | 1,423 | 1,980 | 5,244 | 316 | 5 | 32 |
| Strip Mines (abandoned) | 18 | 436 | 2,142 | 1,272 | 3,559 | 176 | 96 | 105 |
| Strip Mines (active) | 2 | 22 | 326 | 140 | 462 | 2 | 2 | 8 |
| Shaft Mines (abandoned) | 12 | 14,293 | 109,451 | 142,210 | 251,311 | 46,037 | 1,242 | 2,484 |
| Combination Mines (abandoned) | 6 | 352 | 1,941 | 2,195 | 4,240 | 183 | 13 | 119 |
| Refuse Piles | 14 | 262 | 6,352 | 681 | 7,375 | 1,536 | 73 | 261 |
| Coal Outcrop | 1 | 5 | -1 | 5 | 3 | 0 | 0 | 0 |
| Oil Well | 1 | 45 | -149 | 79 | 346 | 0 | 0 | 0 |
| TOTALS | 99 | 20,433 | 153,570 | 183,730 | 337,341 | 55,306 | 1,663 | 4,733 |

The following is a description of the seven principal sources mentioned above. A listing of these sources is shown in Table 32. The location of these mine sites are shown in Figure 20.

## PRINCIPAL SOURCES

### Mine No. 5083

The acid load of nearly 24 tons per day discharged by the St. Michael Shaft Mine was the largest load encountered in the entire Kiskiminetas River basin. The abandoned mine is located on a small unnamed tributary which joins the South Fork Little Conemaugh River near the communities of St. Michael and Creslo. The two shaft entries to the mine have been sealed. A large diameter pipe is situated on the bank of the unnamed tributary mentioned above. The measured effluent discharged from this bore hole pipe at the time of survey was 3,272 gpm. Two large refuse piles are also associated with the mine and contributed a highly mineralized effluent to the same small unnamed tributary.

### Mine No. 5100

Mine No. 5100 is located adjacent to Route 869 in the small community of Allendale. The 1,408 gpm effluent drained from the original concrete mine portal. This portal is still intact for some distance into the hillside. The drainage is piped under the road bed and empties to the South Fork Conemaugh River. The acid load was 12,334 lb/day.

## TABLE 32

### Principal mine drainage sources

### Little Conemaugh River

| Mine No. | Type of Mine | Flow (gpm) | pH | Specific Conductance | Acidity mg/l | Acidity lb/day | Receiving Stream |
|---|---|---|---|---|---|---|---|
| 5083 | Shaft Mine | 3,272 | 4.5 | 3500 | 1215 | 47,706 | Unnamed Tributary to South Fork Little Conemaugh River |
| 5100 | Drift Mine | 1,408 | 2.9 | 2000 | 730 | 12,334 | South Fork Little Conemaugh River |
| 5114 | Shaft Mine | 1,400 | 4.3 | 2500 | 705 | 11,844 | Little Conemaugh River |
| 5129 | Shaft Mine | 3,784 | 5.0 | 2200 | 500 | 22,704 | Little Conemaugh River |
| 5130 | Drift Mine | 1,039 | 3.8 | 2800 | 735 | 9,164 | South Fork Little Conemaugh River |
| 5154 | Shaft Mine | 1,730 | 3.1 | 850 | 300 | 6,228 | Sulphur Creek |
| 5290 | Shaft Mine | 2,282 | 2.5 | 2050 | 415 | 11,364 | Trout Run |
|  | TOTALS | 14,915 |  |  |  | 121,344 |  |

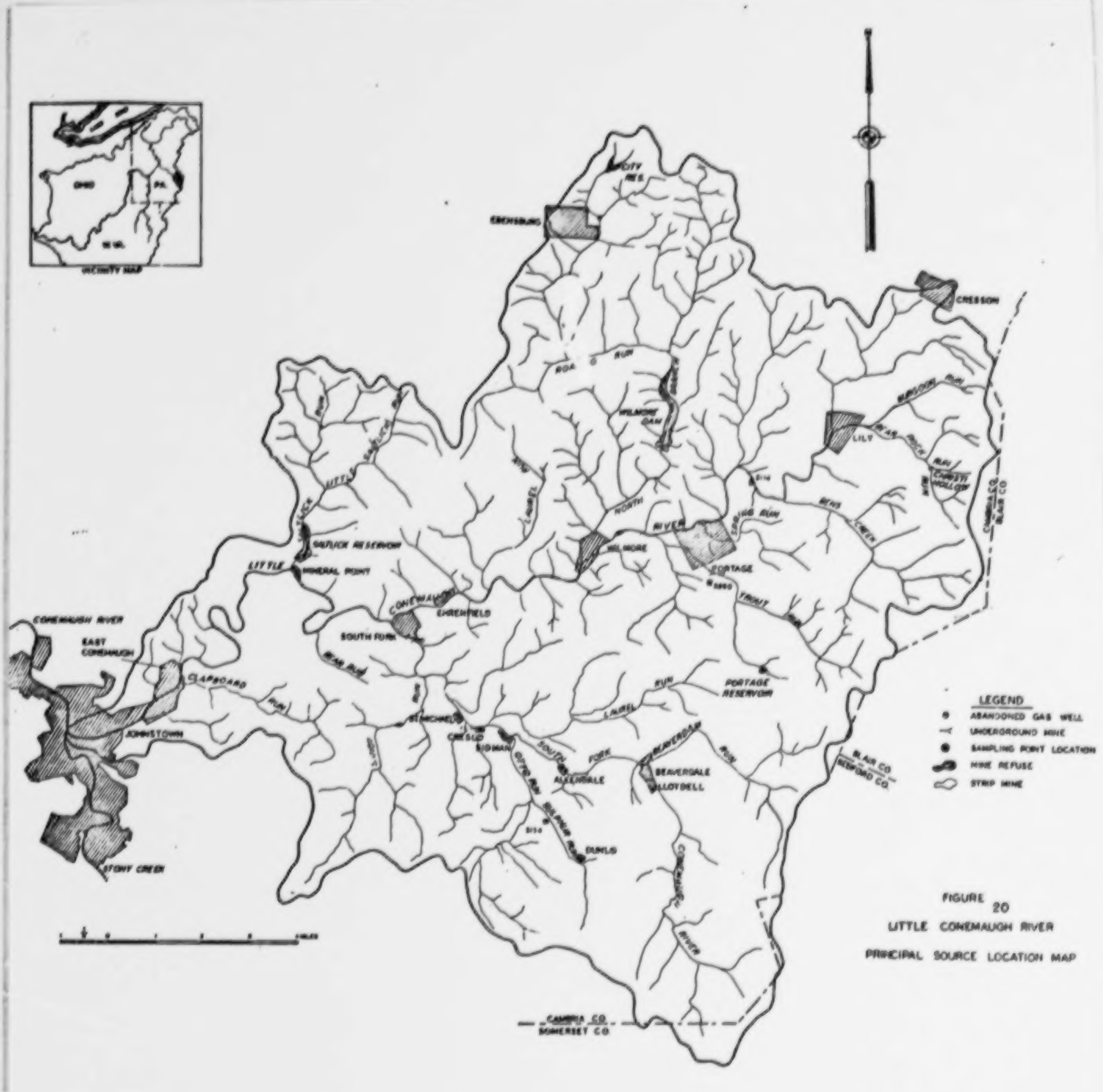
OHIO
PA.
W.VA.
VICINITY MAP
CITY RES.
EBENSBURG
CRESSON
ROARING RUN
WILMORE DAM
LILY
BEAR ROCK RUN
CHRISTY HOLLOW RUN
BENS CREEK
SPRING RUN
NORTH BRANCH
RIVER
WILMORE
PORTAGE
TROUT RUN
PORTAGE RESERVOIR
LITTLE CONEMAUGH
LITTLE PAINT CREEK
SHEFFLER RESERVOIR
MINERAL POINT
CONEMAUGH
EHRENFIELD
SOUTH FORK
BEAR RUN
CLAPBOARD RUN
ST. MICHAEL
CRESSON
SIDMAN
SOUTH FORK
LAUREL RUN
OTTO RUN
ALLENDALE
BEAVERDALE
BEAVERDAM RUN
LLOYDELL
DUNLO
CONEMAUGH RIVER
EAST CONEMAUGH
JOHNSTOWN
STONY CREEK
CAMBRIA CO.
BLAIR CO.
BEDFORD CO.
SOMERSET CO.
MILES
LEGEND
● ABANDONED GAS WELL
UNDERGROUND MINE
● SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE

FIGURE 20
LITTLE CONEMAUGH RIVER
PRINCIPAL SOURCE LOCATION MAP

Mine No. 5114

The 1400 gpm effluent measured at this mine site (borehole) is reported to result from the abandoned Sonman Mine. At the time of sampling, the acid load contributed by No. 5114 was 11,844 lb/day. No additional information was obtained concerning this major discharge point.

Mine No. 5129

This mine discharge point was another borehole from the Sonman Mine. The borehole may act as a common discharge point for other underground mines interconnected with the Sonman workings. The effluent measured at this site was 3,784 gpm which carried an acid load of 22,704 lb/day. A second discharge is located adjacent to No. 5129. The second discharge point (No. 5008) is an artesian effluent from the pipe casing hole which once carried power lines to the underground mine. The acid load from No. 5008 was 1,601 lb/day.

Mine No. 5130

This drift mine was developed along the bank of the South Fork Conemaugh River just a few feet above the level of the river. There is no direct access to the discharge point. It is located along the upstream end of the railyard situated on the South Fork Conemaugh River. A hillside slump is all that remains of the original opening. The 1,039 gpm effluent is piped under the numerous rail lines and discharges directly to the South Fork. The acid load was 9,164 lb/day.

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## Mine No. 5154

This mine was primarily responsible for the degraded water quality found at the mouth of Otto Run, a tributary to the South Fork Conemaugh River. The discharge point is actually a borehole located in the east bank of Sulphur Creek which is, in turn, a tributary to Otto Run. The effluent was 1,730 gpm and carried an acid load of 6,228 lb/day. A local surface mine operator reported this borehole drained a series of interconnected shaft or slope mines. These mines included the Dunlo, Yellow Creek, and Henrietta Mines.

## Mine No. 5290

The abandoned Miller Shaft Mine, located on the lower portion of Trout Run, discharged an acid load of 11,364 lb/day. The discharge point is located approximately 150 yards below (downstream) the tipple. At least two additional openings were located at the tipple site; however, both openings are sealed and dry. The borehole discharged an artesian effluent of 2,282 gpm.

# STONY CREEK
# MINE DRAINAGE INVENTORY

# STONY CREEK

## SUMMARY AND CONCLUSIONS

1. Stony Creek drains an area of 466 square miles in Somerset and Cambria Counties. Stony Creek and its principal tributaries are affected in varying degrees by coal mine discharges over nearly their entire lengths. The drainage areas of Stony Creek below the community of Stoystown, Shade Creek, and Paint Creek are the portions of the watershed most seriously affected by coal mine discharges. Although Quemahoning Creek is affected by coal mine discharges, the water quality degradation is not as severe as in the other principal tributaries.

2. A total of 199 discharging sources and approximately 5,700 acres of surface mined land were investigated in the study area. Discharges from coal mine sources ranged from one to 2,899 gpm and totalled 23.7 million gallons per day (mgd). The total net acid load discharged by the 161 sources was 97,310 lb/day.

3. Approximately 40 coal mines were in operation throughout the Stony Creek watershed at the time of study. A total of eleven mine effluents were sampled at the active sites. The acid load contributed by these sources was 6,430 lb/day. Treatment facilities have since been installed at several of the active mine effluents.

4. Abandoned drift mines were the major source of mine drainage in the Stony Creek watershed. Shaft mines and mine refuse piles were also major contributors. These three source types contributed a combined acid load of 84,145 lb/day, about 86 percent of the total source acid load discharged by all 199 sources.

5. A total of thirteen principal sources of mine drainage discharge were located in the study area. These sources include ten drift mines, two shaft mines, and one mine refuse pile. These 13 sources discharged a total net acid load of 61,761 lb/day. This represents 63 percent of the total acid load discharged by all 199 sources throughout the Stony Creek watershed.

## DESCRIPTION OF AREA

Stony Creek drains an area of 466 square miles located in Somerset and Cambria Counties. Stony Creek and the Little Conemaugh River join at Johnstown to form the Conemaugh River.

The headwaters of Stony Creek rise near the community of Berlin and flow generally north to Johnstown. Principal tributaries and their drainage areas are Quemahoning Creek (98.8 square miles), Shade Creek (98.4 square miles), and Paint Creek (37.0 square miles).

## STREAM WATER QUALITY

Stony Creek and its three principal tributaries are affected in varying degree by coal mine discharges over nearly their entire lengths. The water quality of Shade Creek and Paint Creek is seriously degraded by mine discharges in nearly all portions of the drainage area. The distribution of the pollutant discharges are such that natural downstream recovery becomes impossible and the acid condition persists at the mouth of the tributaries.

Quemahoning Creek above Sipesville was unaffected by mine drainage. Below this point the stream receives numerous pollutant discharges. Although Quemahoning Creek is degraded as a result of mine drainage, it is the least affected portion of the Stony Creek watershed. A large privately owned reservoir is located near the mouth of the creek which, after treatment, is used for industrial water supply.

The main stem of Stony Creek is seriously degraded by mine drainage. This is particularly evident in the lower half of the watershed. Above Stoystown, the water quality of Stony Creek improves rapidly. Although numerous discharge points are located above Stoystown, the cumulative effect is limited to localized areas of degraded water quality. The upper area of the watershed contains several streams which support varied forms of aquatic life including stocked trout.

During the course of the field study, several stream locations were sampled for chemical analysis (Table 33, Figure 21). These stations were selected to measure the cumulative effects of mine drainage. A summary of the stream data is presented in Table 34.

## Table 33

## Stream water quality sampling stations

## Stony Creek Watershed

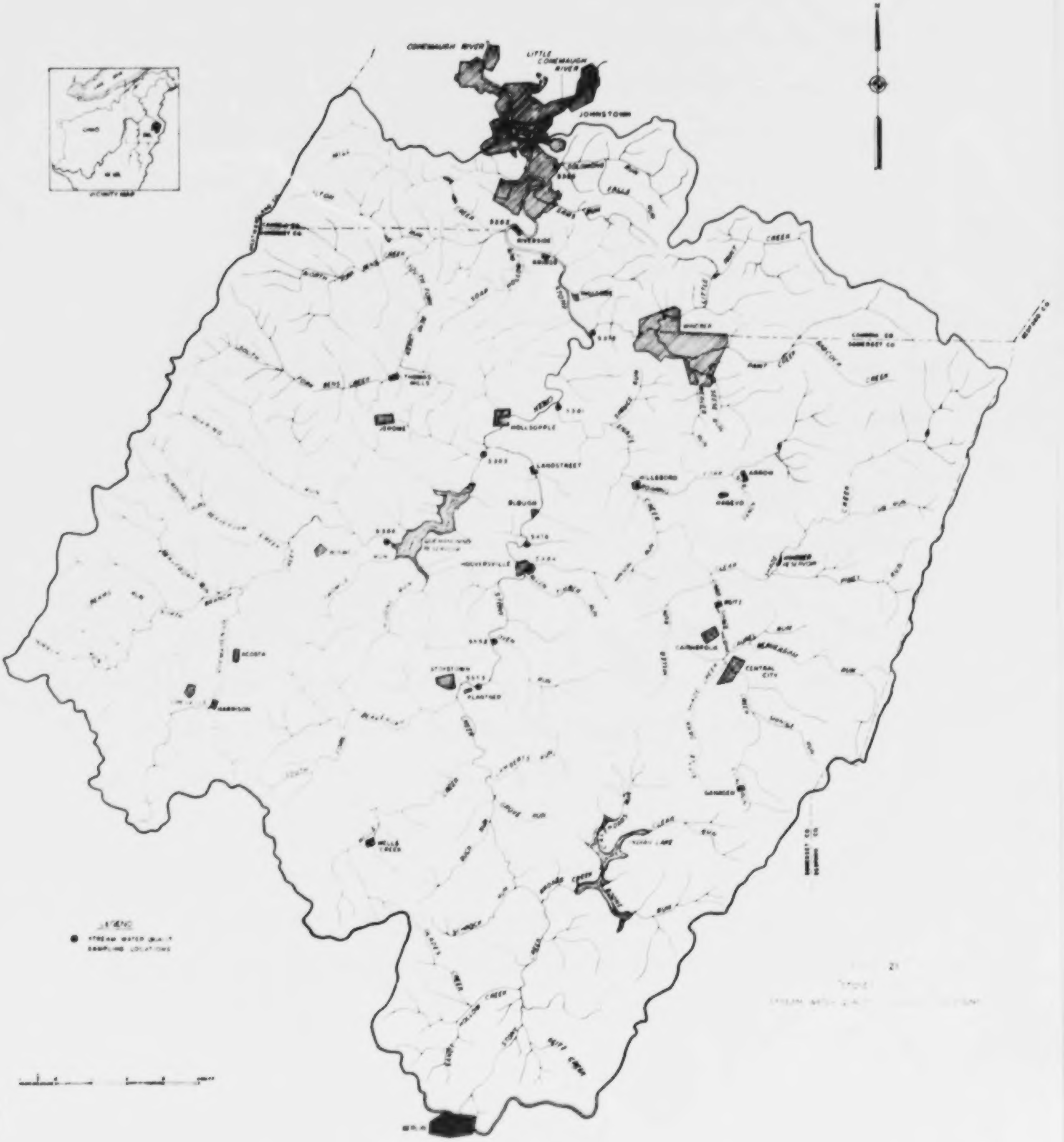
| Station Number | Sampling Period | Stream | Location |
|---|---|---|---|
| 5379 | Aug., Sept., Nov., 1968 | Paint Creek | Near mouth |
| 5381 | Aug., Sept., Nov., 1968 | Shade Creek | Near mouth |
| 5382 | Aug., Oct., Nov., 1968 | Stony Creek | USGS gate @ Riverside |
| 5383 | Aug., Oct., Nov., 1968 | Quemahoning Creek | Near mouth |
| 5384 | Aug., Oct., Nov., 1968 | Unnamed trib. to Stony Creek | Near mouth |
| 5385 | Aug., Oct., Nov., 1968 | Solomon Run | Near mouth |
| 5386 | Aug., Sept., Nov., 1968 | Quemahoning Creek | Above reservoir |
| 5475 | Aug., Oct., Nov., 1968 | Unnamed trib. to Stony Creek | Near mouth |
| 5552 | Sept., Oct., Nov. 1968 | Oven Run | Near mouth |
| 5553 | Sept., Oct., Nov. 1968 | Stony Creek | At Stoystown |

## Table 34

### Stream water quality data

### Stony Creek

| Station No. | Sampling Date | Flow (gpm) | pH | Specific Conductance | Total Acidity mg/l | Total Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5379 | Aug. 20, 1968 | 3,430 | 3.5 | 1,700 | 405 | 16,570 | 252 | 10,372 | 700 | 28,812 | 17.4 | 716 | 5.2 | 214 | 20.3 | 836 |
| 5379 | Sept. 9, 1968 | 3,071 | 3.8 | 1,200 | 390 | 14,372 | 252 | 9,287 | 630 | 23,217 | 15.9 | 586 | 5.1 | 188 | 23.4 | 862 |
| 5379 | Nov. 7, 1968 | 24,288 | 5.2 | 460 | 134 | 39,055 | 90 | 26,231 | 205 | 59,748 | 17.0 | 4,955 | 2.5 | 729 | 9.2 | 2,681 |
| 5381 | Aug. 20, 1968 | 7,965 | 2.8 | 1,500 | 255 | 24,373 | 159 | 15,197 | 400 | 38,232 | 5.0 | 478 | 3.8 | 363 | 9.4 | 898 |
| 5381 | Sept.11, 1968 | 12,247 | 3.3 | 1,160 | 295 | 43,354 | 171 | 25,131 | 450 | 66,134 | 9.6 | 1,411 | 4.2 | 617 | 14.3 | 2,102 |
| 5381 | Nov. 14, 1968 | 18,662 | 5.1 | 700 | 168 | 37,623 | 114 | 25,529 | 250 | 55,986 | 24.3 | 5,442 | 2.7 | 605 | 9.4 | 2,105 |
| 5382 | Aug. 21, 1968 | 124,200 | 3.8 | 1,250 | 230 | 342,792 | 280 | 417,312 | 495 | 737,748 | 3.4 | 5,067 | 3.2 | 4,769 | 9.1 | 13,563 |
| 5382 | Oct. 31, 1968 | 10,800 | 3.6 | 1,500 | 290 | 37,584 | 290 | 75,168 | 580 | 75,168 | 13.4 | 1,737 | 3.7 | 480 | 12.3 | 1,594 |
| 5382 | Nov. 14, 1968 | 36,000 | 4.6 | 800 | 22 | 9,504 | 166 | 71,712 | 360 | 15,552 | 9.5 | 4,104 | 1.9 | 821 | 7.0 | 3,024 |
| 5383 | Aug. 21, 1968 | 250 | 7.8 | 630 | -5 | -15 | 226 | 678 | 210 | 630 | 0.6 | 2 | 1.7 | 5 | 0.0 | 0 |
| 5383 | Oct. 31, 1968 | 150 | 8.2 | 580 | -16 | -29 | 183 | 329 | 170 | 306 | 0.6 | 1 | 1.3 | 2 | 0.8 | 1 |
| 5383 | Nov. 14, 1968 | 250 | 6.9 | 850 | 60 | 180 | 264 | 792 | 300 | 900 | 0.6 | 2 | 2.6 | 8 | 9.7 | 29 |
| 5384 | Aug. 21, 1968 | 630 | 3.8 | 1,400 | 261 | 1,973 | 306 | 2,313 | 540 | 4,082 | - | - | - | - | - | - |
| 5384 | Oct. 31, 1968 | 480 | 3.3 | 1,500 | 330 | 1,901 | 300 | 1,728 | 540 | 3,110 | 3.9 | 22 | 2.8 | 16 | 11.9 | 69 |
| 5384 | Nov. 14, 1968 | 550 | 4.4 | 1,300 | 261 | 1,723 | 318 | 2,099 | 555 | 3,663 | 4.4 | 29 | 2.8 | 18 | 10.0 | 66 |
| 5385 | Aug. 21, 1968 | 1,100 | 3.4 | 2,200 | 450 | 5,940 | 452 | 5,966 | 900 | 11,880 | 14.6 | 193 | 4.7 | 62 | 14.0 | 185 |
| 5385 | Oct. 31, 1968 | 600 | 3.3 | 2,100 | 565 | 4,068 | 556 | 4,003 | 1,225 | 8,820 | 52.7 | 379 | 5.8 | 42 | 15.7 | 113 |
| 5385 | Nov. 14, 1968 | 400 | 5.9 | 1,900 | 314 | 1,507 | 436 | 2,092 | 860 | 4,128 | 35.7 | 171 | 3.9 | 19 | 14.7 | 71 |
| 5386 | Aug. 22, 1968 | 5,770 | 7.8 | 925 | 127 | 8,793 | 286 | 19,803 | 370 | 25,619 | 7.5 | 519 | 3.5 | 242 | 2.5 | 173 |
| 5386 | Nov. 14, 1968 | 13,100 | 6.9 | 700 | 82 | 12,890 | 179 | 28,139 | 210 | 33,012 | 0.2 | 31 | 1.9 | 299 | 2.3 | 362 |
| 5476 | Aug. 27, 1968 | 126 | 3.0 | 1,450 | 500 | 756 | 210 | 318 | 760 | 1,149 | 30.5 | 46 | 3.3 | 5 | 22.2 | 34 |
| 5476 | Oct. 31, 1968 | 60 | 3.3 | 1,600 | 420 | 302 | 304 | 219 | 740 | 533 | 27.5 | 20 | 3.6 | 3 | 20.3 | 15 |
| 5476 | Nov. 14, 1968 | 110 | 3.4 | 1,300 | 405 | 535 | 250 | 330 | 675 | 891 | 24.7 | 33 | 3.2 | 4 | 17.8 | 23 |
| 5552 | Sept.11, 1968 | 247 | 2.8 | 1,500 | 505 | 1,497 | 230 | 682 | 640 | 1,897 | 18.4 | 55 | 9.6 | 28 | 30.8 | 91 |
| 5552 | Oct. 31, 1968 | 300 | 3.0 | 1,770 | 610 | 2,196 | 145 | 522 | 640 | 2,304 | 25.8 | 93 | 11.0 | 40 | 34.0 | 122 |
| 5552 | Nov. 14, 1968 | 420 | 4.9 | 1,300 | 310 | 1,562 | 134 | 675 | 435 | 2,192 | 14.8 | 75 | 8.6 | 43 | 18.5 | 93 |
| 5553 | Sept.12, 1968 | 7,105 | 7.7 | 800 | -38 | -3,240 | 255 | 21,741 | 290 | 24,725 | 2.0 | 171 | 0.3 | 26 | 1.6 | 136 |
| 5553 | Oct. 31, 1968 | 5,110 | 8.3 | 700 | 86 | 5,273 | 202 | 12,387 | 230 | 14,104 | 0.7 | 43 | 0.9 | 55 | 1.8 | 110 |
| 5553 | Nov. 14, 1968 | 14,464 | 6.7 | 675 | 11 | 1,909 | 226 | 39,226 | 190 | 32,978 | 1.1 | 191 | 1.2 | 208 | 1.7 | 295 |


CONEMAUGH RIVER
LITTLE CONEMAUGH RIVER
JOHNSTOWN
RIVERSIDE
CAMBRIA CO.
SOMERSET CO.
WESTMORELAND CO.
BEDFORD CO.
HOLLSOPPLE
LANDSTREET
HOOVERSVILLE
STOYSTOWN
CENTRAL CITY
ACOSTA
INDIAN LAKE
CREEK
RUN
VICINITY MAP
OHIO
LEGEND
STREAM WATER QUALITY SAMPLING LOCATIONS

21

FIGURE

STREAM WATER QUALITY [illegible]

The sources of pollution inventoried in the Stony Creek subbasin were limited to those sources emanating from active or abandoned coal mining operations. No attempts were made to document pollutional discharges of a different source type. Although mine drainage is the major source of pollution in the streams of the Kiskiminetas River basin, pollution problems from sources other than mine drainage do exist. The effects upon the water quality of the Conemaugh River, Little Conemaugh River, and Stony Creek from steel mill and other industrial discharges were not documented. During the course of the field study, discharges from such sources were located along the banks of the above mentioned streams. This was particularly evident in the Johnstown and nearby community areas.

## SOURCES OF MINE DRAINAGE

For description of the mine drainage sources located in the Stony Creek watershed, the following section of this document is divided into four separate parts. These include main stem Stony Creek, Quemahoning Creek, Shade Creek, and Paint Creek. All mine sites inventoried in the Stony Creek watershed are shown in Figure 22, following the source description section.

During early fall of 1971, a reinvestigation of the mine drainage sources was conducted in the Shade Creek watershed. The purpose of this reinvestigation was an attempt to locate sources of mine drainage discharge which were not documented in this watershed during the initial survey. In preparation of the Shade Creek portion of the Stony Creek report, it was determined that an insufficient number of sources had been found in the headwater areas of Shade Creek. In particular, the water quality of Dark Shade Creek in the vicinity of Central City was degraded to a degree which far exceeded the number of mine discharges inventoried in that area. The reinvestigation effort was primarily centered around the Central City area.

A total of twelve additional mine discharges were located in the Central City area. These sources contributed a combined acid load exceeding 6.5 tons per day. Approximately one-half of this acid load was discharged by the large drainway north of Central City (see text). Discharge No.'s 5206 thru 5217 represent the additional sources sampled during the 1971 reinvestigation of Shade Creek.

## STONY CREEK

### Headwater Area

Mine No. 5513 was the farthest upstream source of mine drainage discharge in the Stony Creek watershed. An effluent of 15 gpm discharged from the slope opening of this mine. The acid load received by the headwaters of Stony Creek was 175 lb/day.

In downstream order, the next mine discharges were located on Reitz Creek. Mine No.'s 5511 and 5512 discharged a combined acid load of 267 lb/day. Mine No. 5511 was a caved drift mine and Mine No. 5512 was a drift mine which had been intersected by a surface mine.

## Glades Creek

Glades Creek drains a portion of the watershed which parallels the Pennsylvania Turnpike. Several surface and underground mines have been operative immediately adjacent to the turnpike. At the time of survey, two drift mines were in operation. One of these was the Burk Coal Company on the south side of the turnpike. The mine was dry when inventoried and has since been abandoned and sealed. The second mine was operated by Everett Snyder. This mine is still in operation and reportedly dry.

## Rhoads Creek

Two discharges (No.'s 5527 and 5528) contributed a combined acid load of 231 lb/day to Boone Run, a tributary to Rhoads Creek. The source of these discharges was an abandoned slope mine. Several additional minor sources of acid discharge were located on Rhoads Creek and tributaries to Rhoads Creek. Two surface mines were in operation at the time of survey. One of these operations was dry and the other mine contributed an acid load of 127 lb/day (Mine No. 5524).

## Schrock Run

In the 4.9 square mile drainage area of Schrock Run, a total of four discharging mine sites were located. Additional underground and surface mines were inventoried in the Schrock Run area; however, they were dry. Mine No. 5516 contributed the major portion of the mine drainage discharge received by Schrock Run. Mine No. 5516 is a small reclaimed area strip mine. A

60 gpm effluent representing cumulative seepage along the base of the disturbed area carried an acid load of 240 lb/day. Two surface mines were in operation during the survey period and both were dry.

## Grove Run

A small hilltop area surface mine is located along the north bank of Grove Run in the headwater area. The mine is dry; however, about 40 feet below the disturbed area a 36 gpm artesian effluent discharged to Grove Run. The acid load carried by this discharge was 346 lb/day.

## Lamberts Run

The total acid load discharged to the 3.9 square mile drainage area of Lamberts Run was 747 lb/day. Mine No. 5520 is a stripped out drift mine. The major portion of the 63 gpm effluent measured at this site emanated from the area near the original mine portal. The acid load carried to Lamberts Run was 193 lb/day. A similar effluent from Mine No. 5521 discharged an acid load of 316 lb/day. The last discharge found in the Lamberts Run area resulted from an active surface mine. Settling ponds had been constructed at this mine; however, no treatment was supplied. The acid load was 238 lb/day (Mine No. 5522).

## Wells Creek

Mine No. 5427 was located near the headwaters of Wells Creek. There are two openings to the mine and both were discharging at the time of inspection. The combined effluent was 225 gpm which carried an acid load of 1,215 lb/day.

Two underground mine discharges (No.'s 5424 and 5425) were located along Wells Creek near the small community of Wells Creek. The 222 gpm effluent from Mine No. 5424 discharged from a mine which, according to a local resident, was in operation in 1895. The acid load carried by this discharge was 440 lb/day. Mine No. 5425 was a more recent underground mine which reportedly intersected the workings of Mine No. 5424. The acid load discharged by Mine No. 5425 was 955 lb/day.

Several additional underground mines and several surface mines were located in the remaining downstream areas of Wells Creek. However, these mines were either dry or discharged only minor acid loads

Stony Creek, main stem

Several surface and underground mine operations were located along the main stem of Stony Creek between Wells Creek and the downstream confluence of Beaverdam Creek. The only source of abandoned mine discharge resulted from Mine No. 5484. A 27 gpm discharge from the base of this slumped drift opening carried an acid load of 199 lb/day to Stony Creek. At the time of survey, the only other source of mine discharge resulted from an active surface mine operation. The mine was located along the east bank of Stony Creek (No. 5509), and contributed an acid load of 19 lb/day.

## Beaverdam Creek

The water quality in the 19 square mile drainage area of Beaverdam Creek is only moderately affected by mine drainage discharges. The two discharging sources were both located near the mouth of the tributary and contributed a combined acid load of 259 lb/day.

The 367 gpm discharge from Mine No. 5554 results from the abandoned Reading No. 3 Mine. This effluent emerged from the airway of the mine. The acid load was only 66 lb/day; however, the discharge imparted some discoloration to Beaverdam Creek.

Mine No. 5508 was the only other source of mine discharge on this tributary. An acid load of 193 lb/day was carried by the 95 gpm effluent from this abandoned drift mine.

## Stony Creek, main stem - Beaverdam Creek to Oven Run

Mine No.'s 5482 and 5483 are located on the east bank of Stony Creek near the community of Kantner. Both mine openings are located in an area of coal loading facilities approximately 50 yards downstream from the junction of Route 30 and County Road 546. The area in front of the openings was used for storage of junk cars. The combined acid load discharged by these mines was 111 lb/day.

Mine 5561 is located along the east bank of Stony Creek approximately 0.7 mile downstream of the two mines mentioned above. There were several drift openings in the immediate area; however, only Mine No. 5561 had a significant discharge. The effluent was 24 gpm which carried an acid load of 173 lb/day.

A series of drift mine discharges were located along the east bank hillside downstream of Mine No. 5561. These mines included No.'s 5481, 5485, and 5486. The discharges measured at No.'s 5485 and 5486 drained from the portal and airway to a small semi-active drift mine. The mine had been closed for failure to provide treatment of the drainage; however, there were numerous loaded mine cars in front of the portal. The combined acid load discharged by No.'s 5485 and 5486 was 143 lb/day.

## Oven Run

Although only four sources of mine drainage discharge were located in the seven square mile drainage area of Oven Run, the water quality of the small tributary was seriously affected by coal mine drainage. Cumulative seepage from the base of a reclaimed surface mine was responsible for the major portion of the acid load discharged to Oven Run. This was Mine No. 5479 and contributed an acid load of 353 lb/day. Several surface mines were in operation but were dry at inspection. The active underground Solar No. 2 and No. 3 Mines operated in the Oven Run drainage area, but were dry at inspection. A third drift mine was operated by the Shubert and Kraylick Coal Company. The mine was dry at inspection and since that date has been closed.

Stream sampling was conducted at the mouth of Oven Run coincident with the mine inventory survey. At this time, Oven Run at the mouth, carried an acid load ranging from 1500 lb/day to 2200 lb/day (Table 34, Station No. 5552).

### Stony Creek, main stem - Oven Run to Fallen Timber Run

Five surface mines and at least 10 underground mine openings were located on a small unnamed tributary to Stony Creek which joins the main stem approximately 0.7 mile below Oven Run. The major source of mine drainage discharge in this area resulted from Mine No. 5477. This mine is located at the headwaters of the tributary and discharged an acid load of 437 lb/day. The remaining mine operations were either dry or contributed only negligible acid discharges.

A large refuse pile from the old underground Wilber Mine is located on the east bank of Stony Creek just below the mouth of the unnamed tributary mentioned above. The principal portion of the Wilber Mine discharge (141 gpm) was piped under Route 53 to the preparation facility of the Solar Fuel Company. A portion of this discharge was lime treated by Solar Fuel Company for use in their facility. The pre-treatment acid load in this effluent (No. 5464) was 1,244 lb/day. A second untreated discharge of 8 gpm also discharged from the Wilber Mine. This was discharge No. 5465 which carried an acid load of 69 lb/day. According to a salvage operator at the Wilber Mine, who once "pulled pillars" in the Wilber Mine, the entire discharge from the mine was at one time piped under Route 53. However, due to a roof fall within the mine, a portion of the discharge is diverted and is not piped under the road bed. A third discharge (No. 5471) was attributed to seepage from the refuse pile at the Wilber site. Although the cumulative seepage totalled only 3 gpm, the acidity concentration was 25,000 mg/l with a resultant acid load of 900 lb/day.

Ten drift mine openings were also located along the west bank hills adjacent to this section of Stony Creek. However, all of these mines were dry.

## Fallen Timber Run

Two surface mines and two underground mines were located in the 2.5 square mile drainage area of Fallen Timber Run. All of these operations were abandoned and dry. However, small seepage increments from the surface mines contributed an undetermined amount of mine drainage to Fallen Timber Run.

## Stony Creek, main stem - Hooversville to Hollsopple

An unnamed tributary, which drains the area north and east of Hooversville, was grossly polluted by acid mine drainage. Mine No. 5457 was the first of three major discharges located on this tributary. The 120 gpm effluent from Mine No. 5457 resulted from a point of intersection between a surface and underground mine. The underground mine was reportedly the Baker Whitely No. 2 Mine. The acid load carried by the discharge was 648 lb/day.

Mine No. 5456 is located on the opposite bank of the tributary just a short distance downstream from Mine No. 5457. The 215 gpm discharge at this site emerged from the base of a slumped drainway adjacent to a large abandoned mine tipple. This discharge drains from the Whitely No. 1 Mine. The original portal to this mine is located a short distance downstream of the tipple but was bricked shut and dry.

The third major discharge on this tributary resulted from the Knickerbocker No. 1 mine located near the mouth of the tributary. This was Mine No. 5455 which discharged an effluent of 180 gpm from the still open drift mouth.

An active drift mine was in operation near the headwaters of this tributary. This was the George Hritz Mine which is located in the base of a strip mine high wall. A minimal amount of seepage (1 gpm) was observed at the time of inspection. However, this seepage appeared to result more from the strip mine than from the underground mine. The mine is still active and reportedly dry.

Stream sampling was conducted at the mouth of this unnamed tributary coincident with the mine inventory survey. During this period, the tributary at mouth carried an acid load ranging from 1,700 lb/day to 2,000 lb/day (Table 33, Station No. 5384).

Mine No. 5466 is located on another unnamed tributary to Stony Creek. The acid load discharged by this mine was 340 lb/day.

Mine No.'s 5454, 5474, and 5475 were three additional drift mines along the east bank of Stony Creek. The acid loads discharged to main stem Stony Creek were 380 lb/day, 22 lb/day, and 107 lb/day, respectively.

Five additional discharging mines were located in the area downstream of the above mentioned mines. Three of these were in the vicinity of Blough, one at Landstreet, and one near Hollsopple. However, none of these mines contributed significant acid loads to Stony Creek.

### Stony Creek, main stem - Hollsopple to mouth of Shade Creek

The only major source of mine drainage discharge along this section of Stony Creek resulted from Mine No. 5504. This drift mine is located at the tip of a one mile contour surface mine. The surface mine has not intersected the drift mine portal; however, it has probably created points of intersection between the two operations along the face of the hill. The discharge measured at the mine opening was 270 gpm which carried an acid load of 1,037 lb/day.

### Stony Creek, main stem - Shade Creek to Paint Creek

Mine No. 5502 is located along the east bank of Stony Creek just below the confluence of Shade Creek. A series of three drift mines were located along the face of the hillside. Two were dry and the other contributed a discharge of 420 gpm which carried an acid load of 3,830 lb/day.

Downstream of Mine No. 5502 a contour surface mine was located on an unnamed tributary to Stony Creek. Although there were no direct discharges emanating from the surface mine, the tributary was affected by cumulative seepage which occurred at the base of the disturbed area. A sample collected below the mine indicated that the tributary carried an acid load of 256 lb/day (No. 5503).

On the west bank of Stony Creek, two mine openings were located on the steep hill slope several hundred feet above the stream. The openings apparently represent points where the underground mine broke through to the surface. The 130 gpm effluent (No. 5421) spreads over a wide area destroying all trees and vegetation as the drainage cascades down the hillside. The acid load contributed by this source was 874 lb/day.

Mine No. 5501, located on the east bank, is similar to Mine No. 5421 mentioned above. Mine No. 5501 is located on the hillside approximately 200 vertical feet above stream level. The acid load carried by the 90 gpm effluent was 386 lb/day.

A small dam is located on Stony Creek approximately 1.5 miles above the confluence with Paint Creek. At this site, water is withdrawn from Stony Creek and subjected to lime neutralization. The treated water is then piped via large culverts through the surrounding hillsides for industrial use in Johnstown.

### Stony Creek, main stem - Paint Creek to Bens Creek

The first acid load discharged to Stony Creek below the confluence of Paint Creek emanated from one of the several tunnels which carries water from the various areas of the Stony Creek watershed to the steel mills in Johnstown.

Source No. 5420 is located on the west bank of Stony Creek less than one mile below the confluence of Paint Creek. Entrance to the tunnel is prohibited by an iron gate. At the base of the gate an iron discolored discharge of 10 gpm was sampled. The acid load of this effluent was 26 lb/day.

Several underground mine discharges were located on an unnamed tributary which enters Stony Creek at Ingleside. Mine No.'s 5344 and 5346 discharged acid loads of 161 lb/day and 359 lb/day, respectively.

Three additional drift mine discharges (Mine No.'s 5341, 5342, 5343) were located on the next unnamed downstream tributary to Stony Creek. The combined acid load of these discharges was 1,147 lb/day.

An active drift mine operated by the J & R Sales Coal Company (formerly East Windber Coal Company) was located on the west bank of Stony Creek directly across from the three mines mentioned above. At the time of inventory, this mine (No. 5422) contributed an untreated effluent which carried an acid load of 590 lb/day. At the present time, this mine now provides treatment of its mine discharge.

An acid load of 2,398 lb/day was discharged to Stony Creek by an abandoned mine opening located just downstream and on the bank opposite from the large refuse pile operated by the Island Creek Coal Company (formerly the Bird Coal Company). The measured effluent from this mine (No. 5338) was 120 gpm.

A discharge of 75 gpm from the abandoned Bird Coal No. 1 Mine on Soap Hollow was one of two remaining discharges along the Paint Creek to Bens Creek section of Stony Creek. At the time of sampling, the acid load from Mine No. 5413 was 315 lb/day. Approximately 0.4 mile downstream, an effluent of 1,309 gpm from the active Bird No. 2 Mine was discharged to Soap Hollow. At the time of sampling, this discharge carried an acid load of 4,634 lb/day. However, according to the Pennsylvania Department of Environmental Resources, this mine now provides adequate treatment of its mine drainage.

## Bens Creek

The major portion of the mine drainage discharged to the Bens Creek watershed is received by the South Fork of the tributary. A total of eight discharges were located near the headwaters of the South Fork just north of the community of Jerome. All of the discharges emanated from abandoned sites. The total acid load discharged by the eight sources was 3,527 lb/day. Mine No.'s 5407 and 5411, abandoned drift mines, contributed the major portion of this acid load. The acid loads were 909 lb/day and 2,231 lb/day, respectively.

The only other source of mine drainage discharge located in the Bens Creek watershed was found on the main stem of the tributary just below the confluence of the North and South Forks. Mine No. 5404 was an abandoned drift mine adjacent to Route 219. The acid load discharged to Bens Creek was 180 lb/day.

Stream water quality determinations were conducted on Stony Creek at the USGS gage at Riverside. During the sampling period, Stony Creek carried an acid load ranging from 9,504 lb/day to 342,792 lb/day.

Stony Creek, east bank - Bens Creek to Mouth

Mine No.'s 5335, 5336, and 5337 are located along the east bank of Stony Creek almost at stream level. It appears that these discharges represent points where underground mines broke through to the surface for either the installation of an air way or as a means of dewatering the mine. The acid loads discharged by these three sources were 69 lb/day, 161 lb/day, and 28 lb/day, respectively.

Below the area described above, Stony Creek has been channelized along its remaining downstream length. Several large acid discharges were located along the base of the channelization project. At several of the discharge points the remains of old mine openings could be located on the hillside above Stony Creek. However, at several sites, particularly in the greater Johnstown area, no indication of the original mine opening was found. At these sites, the mine drainage emerged from concrete drainways at the base of the channelized stream bed. Such discharges included No.'s 5330, 5331 and 5334. The combined acid load of these effluents was 1,334 lb/day.

The largest acid discharge in this section of Stony Creek was the 3,312 lb/day load from Mine No. 5333. A discharge of 480 gpm was measured at the base of a caved drift mine opening. There are actually two openings at this site; however, the second opening was dry.

## Stony Creek, west bank - Bens Creek to Mouth

Three alkaline effluents were sampled from drainways along the base of the channelized stream bed on the west bank of Stony Creek near Roxbury. The exact origin of these effluents is not known. These three sources (No.'s 5417, 5418, 5419) discharged a combined alkaline load of 433 lb/day.

No. 5416 contributed an acid load of 203 lb/day to Stony Creek. The effluent was collected from a drainway near stream level. The exact origin is unknown but assumed to result from an underground mine.

The largest acid load in the entire 466 square mile drainage area of Stony Creek was found along the west bank of the stream almost directly across from Point Park in downtown Johnstown. On the west bank hillside, a series of three sealed mine openings were located. The mines are dry at the seal; however, about 75 feet below one of the seals a 630 gpm effluent discharged to Stony Creek. At the time of sampling, the acid load was 26,838 lb/day (Mine No. 5415).

## QUEMAHONING CREEK

Quemahoning Creek drains a 98.8 square mile area on the west side of the Stony Creek watershed. The water quality of Quemahoning Creek is affected by numerous mine discharges throughout the drainage area. However, the water quality of this tributary is less severely degraded than the water quality in other areas of the Stony Creek watershed.

### Quemahoning Creek, headwaters area

One abandoned underground mine was located at the very headwaters of Quemahoning Creek north of Somerset. The mine was completely caved, grown over, and dry. There were no additional mines in the headwater area above the small community of Harrison (Quecreek).

Mine No. 5399 discharged an acid load of 917 lb/day to Quemahoning Creek at Harrison. The 235 gpm effluent flows from a drainage pipe adjacent to the mine tipple and loading area. The area behind the old mine has been surface mined. The original mine openings have been filled or covered by the surface mine operation. Another stripped out drift mine (No. 5400) was located almost directly across from Mine No. 5399. The acid load discharged to the receiving tributary was 15 lb/day. A dovered shaft opening was located approximately 0.8 mile upstream of Mine No. 5399. No additional information concerning this opening was available at the time of survey.

### Quemahoning Creek-Harrison to Acosta

A total of seven drift mine openings were located along the west bank of Quemahoning Creek between the communities of Harrison and Acosta. These openings were all located at the base of the hillside and were dry at the time of inspection.

Five surface mines and one drift mine opening were found along the east bank of the creek. The surface mines were dry and the one drift mine (No. 5397) discharged an acid load of 51 lb/day.

### Quemahoning Creek, Acosta to North Branch

Both surface mines and underground mine openings were located along this section of Quemahoning Creek. Four of the drift mines were discharging at the time of inspection. Mine No.'s 5398 and 5394 were located along the main stem of Quemahoning Creek and discharged a total acid load of only 11 lb/day. Mine No.'s 5395 and 5396 were located on an unnamed tributary to Quemahoning Creek. The acid loads discharged by these mines were 20 lb/day and 75 lb/day, respectively.

### North Branch

Thirteen drift mines and approximately 12 surface mines were located in the 25 square mile drainage area of North Branch. In addition, there may have been several shaft mine entries in the area. All of these mine operations, both surface and underground, were dry at the time of inspection.

## Quemahoning Creek, North Branch to Beaverdam Creek

There were no significant discharges of mine drainage along this section of Quemahoning Creek. The large slope or shaft mine at Jenners was dry.

## Beaverdam Creek

Mine drainage discharges in the Beaverdam Creek area were limited to three minor sources near the headwaters of the stream. Mine No. 5555 was a combination mine. A drift opening was at one time located in the highwall of an abandoned surface mine. Both the strip pit and underground mine opening were flooded. A one gpm effluent was discharged from the base of a slumped drift opening at Mine No. 5557. The combined acid load discharged by Mine No.'s 5555 and 5557 was only 8 lb/day.

The 12 gpm effluent sampled at Strip Mine No. 5556 represented a treated discharge. Two seepage areas had occurred below the disturbed area. At the time of inspection, the coal company had channeled this drainage to a series of small impoundments for treatment with soda ash. After treatment the final effluent still carried an acid load of 91 lb/day.

## Quemahoning Creek, Beaverdam Creek to Roaring Run

Old Stoughton Lake is located at the mouth of Beaverdam Creek. This tributary feeds the lake which, in turn, subsequently discharges to Quemahoning Creek. There is no visible sign of mine water inflow to Stoughton Lake. However, the lake appears visually affected by mine drainage. A local resident reported that the lake is fed by a sub-surface artesian discharge emanating from the nearby Boswell Mine. The Somerset 15 minute topographic map indicates another mine opening was at one time located in the immediate vicinity of what is now Stoughton Lake. An estimated overflow of 250 gpm from the lake discharged to Quemahoning Creek. This effluent (No. 5559) had an acidity concentration of 255 mg/l and carried an acid load of 765 lb/day.

There were no additional sources of mine drainage discharge along this section of Quemahoning Creek. Several underground mines, including the Boswell Mine, and one surface mine were inspected in the area but were dry.

### Roaring Run

A recently surface mined area near the headwaters of Roaring Run discharged an acid load of 133 lb/day (No. 5558) to the tributary. The 90 gpm discharge resulted from spoil pile seepage and drainage from the open pit. Treatment facilities had been constructed; however, the drainage was by-passing the facility.

Discharge No.'s 5376 and 5560 are located near the mouth of Roaring Run. The discharges do not flow directly from a mine site but are small artesian discharges along the bank of roaring Run. A local resident reported that there were numerous "seeps" in the immediate area and these discharges were responsible for the discoloration observed in the lower reach of Roaring Run. The acid loads from discharge No.'s 5376 and 5560 were 65 lb/day and 30 lb/day, respectively.

A small drift mine, operated by Mike Budzina, was located near the mouth of Roaring Run. The mine was dry at inspection. The mine is presently still in operation and reportedly dry.

### Quemahoning Creek, below Roaring Run

Only one source of mine drainage discharge was located along Quemahoning Creek below Roaring Run and above the point where Quemahoning Creek empties into Quemahoning Reservoir. The drainage originated from a water well located below a surface mined area. Prior to mining of the area, this well served as a water supply; however, the quality of the water was affected by the surface mining. At the time of sampling, the 18 gpm discharge carried an acid load of 148 lb/day (No. 5375).

### Twomile Run

Twomile Run is one of three tributaries which form Quemahoning Reservoir. Both surface and underground mine operations were located in the Twomile Run drainage area. A total of five mine discharges contributed a total source acid load of 313 lb/day. Mine No.'s 5387 and 5388 discharged the major portion of this load. Mine No. 5387 contributed an acid load of 78 lb/day. All that remains of the original drift portal is a slump in the hillside.

An acid load of 149 lb/day was discharged by Mine No. 5388. The source of this 10 gpm effluent was two slumped drift mine openings. The sample represents cumulative seepage collected below the old openings.

### Higgins Run

Higgins Run is the third tributary which empties into Quemahoning Reservoir. Coal mine operations were almost totally absent in this 5.8 square mile drainage area. Only one mine operation was located and this mine produced an alkaline effluent. This was Mine No. 5377 which contributed an alkaline load of 13 lb/day.

### Quemahoning Creek below Reservoir

The only mine sites located below Quemahoning Reservoir were on an unnamed tributary which enters Quemahoning Creek just above its confluence with Stony Creek. Several underground mines were inspected on this tributary near the community of Jerome; however, they were dry.

## SHADE CREEK

Shade Creek drains a 98.4 square mile area on the east side of the Stony Creek watershed. The water quality of main stem Shade Creek is seriously affected by coal mine discharges over its entire length. Shade Creek is formed by the confluence of its two principal tributaries, Clear Shade Creek and Dark Shade Creek. Clear Shade Creek is unaffected by coal mine discharges while Dark Shade Creek received numerous mine drainage discharges.

## DARK SHADE CREEK

### Headwaters area

Dark Shade Creek is formed by the confluence of Shingle Run and Coal Run. There were no coal mine operations on Shingle Run. However, several surface mines and one underground mine were located at the very headwaters of Coal Run near the community of Gahagen. The opening to the underground mine at Gahagan has caved and there was no drainage at this point. Although the refuse pile from this mine is in continual contact with Coal Run, the water quality of the stream was not seriously affected. A large surface mine is located on the east bank of Coal Run approximately two miles downstream of Gahagen. This surface mine was inactive; however, refuse from a nearby coal preparation plant was trucked to the surface mine and buried in the previously unreclaimed strip cuts. A drift mine operated by the J & R Sales Company was also associated with the preparation plant. This mine did not contribute any discharge to Coal Run.

The first source of drainage to enter Dark Shade Creek resulted from a coal refuse disposal area. This 30 gpm effluent entered the main stem a short distance below the confluence of Coal Run and Shingle Run. This refuse is trucked to the disposal site from another preparation plant located in Central City. The acid load discharged to Dark Shade Creek was 1,836 lb/day (No. 5217). This single effluent was responsible for a complete reversal in the physical appearance of Dark Shade Creek. Above this point, the stream bed was clear. However, below the point of drainage inflow the stream bed as well as the stream banks were grossly discolored.

### Dark Shade Creek, Central City area

A large abandoned mine effluent of 875 gpm was located on Dark Shade Creek in the community of Central City. This effluent drains from a culvert on the property associated with the preparation plant which still operates in Central City. The large mine at this site has been abandoned; however, surface mines in the general area truck coal to this site for preparation prior to loading in rail cars. A local resident reported that this drainage emanated from the Franklin No. 4 mine. The drainage enters Dark Shade Creek directly behind the Central City Fire Station. The acid load was 4,515 lb/day (Mine No. 5293).

### Dark Shade Creek, below Central City

The largest source of mine drainage discharge in the Shade Creek watershed is located on Dark Shade Creek only a short distance below the mouth of Little Dark Shade Creek. At this point, a 2,889 gpm effluent was located in a somewhat swampy area between the railroad tracks and the stream. The effluent drains from a concrete structure located at ground level approximately two feet in height and eight feet in width. The origin of this discharge is unknown but it has obviously been constructed in order to drain a nearby mine. The acid load carried to Dark Shade Creek was 6,934 lb/day (No. 5215).

## Laurel Run

Laurel Run enters Dark Shade Creek a short distance below Mine No. 5215 described above. According to a local resident, a drift mine on the south bank of this tributary was originally sealed by the Works Progress Administration. However, the area was reaffected by later surface mine operations. At the time of inspection, this 45 gpm effluent (Mine No. 5282) discharged an acid load of 134 lb/day to Laurel Run. An active drift mine operated by the Ripple Coal Company was located on Beaverdam Run, a tributary to Laurel Run. At the time of inspection, this mine was dry and since that date the mine has closed and still remains dry.

Two surface mine discharges were also located on Laurel Run. A 95 gpm effluent representing cumulative seepage from strip mine spoil piles carried an acid load of 450 lb/day to Laurel Run (Mine No. 5283). A second surface mine effluent discharged an acid load of 97 lb/day (Mine No. 5284). A drift mine operated by the Horseshoe Coal Company was in operation in this general area. At the time of inspection, the mine was dry. According to information supplied by the Pennsylvania Department of Environmental Resources, this mine has now been closed and remains dry.

There are numerous refuse areas along main stem Dark Shade Creek and along State Route 160 which generally parallels the stream in this area. Much of the area is also quite swampy and in many areas this refuse has been scattered throughout the swamp areas. As a result of leaching from these refuse areas, there are numerous small impoundments of highly acid water. In places, portions of Laurel Run are also diverted through and around the refuse and swamp areas. Several of the small impoundments discharged highly acid effluents. No. 5211 represented such a discharge. This 20 gpm effluent drained to Laurel Run above the point where the stream runs through the swamp area. The acid load was 2,880 lb/day. A similar effluent was located just below the mouth of Laurel Run on the east bank of Dark Shade Creek. At this point, a 15 gpm effluent discharged from a four inch pipe which carried impounded drainage under Route 160. The acid load contributed by this discharge was 977 lb/day (No. 4214).

## Dark Shade Creek, Cairnbrook area

Below the confluence of Laurel Run an abandoned mine effluent of 200 gpm discharged to Dark Shade Creek. The opening has been closed and the drainage emerges from the base of the sealed opening. This was Mine No. 5294 which carried an acid load of 677 lb/day.

An effluent of 23 gpm was collected at the base of the large refuse pile at Cairnbrook. This effluent represents cumulative seepage about the base of the refuse pile. The acid load from this source was 121 lb/day (No. 5213).

## Dark Shade Creek, Reitz area

A series of mine effluents were located along the east bank of Dark Shade Creek north of the small community of Reitz. It appears that underground mines have operated in three separage coal seams and in addition, the upper seam has also been surface mined. Only one of these effluents, No. 5207, was associated with the surface mine. The acid load was only 8 lb/day. The other four discharges, Mine No.'s 5206, 5208, 5209, and 5210 were associated with abandoned drift mines. The combined acid load from these four sources was 306 lb/day.

## Miller Run

Miller Run is a tributary to Dark Shade Creek and joins the stream just above the confluence of Dark Shade Creek with Clear Shade Creek. An active air fan was located near the headwaters of Miller Run but it had no affect upon the water quality of Miller Run. One active and one abandoned surface mine were inspected in the general upstream area, but were dry. However, the water quality of Miller Run is immediately degraded over its remaining downstream length as a result of several discharges which occurred on the west bank of the tributary. A total of four discharges were located at a combined surface and underground mine site. The surface mine is approximately 1.5 mile in length and contains several drift mine openings. In addition, the southeast tip of the surface mine was active. The combined source acid load measured at this site was 319 lb/day. Mine No. 5287 was an active drift mine which contributed a small portion (15 lb/day) of the total 319 lb/day acid load. This drift mine has installed a small treatment facility and produces an alkaline effluent.

The Solar Fuel No. 4 mine also operates in the general area described above. No discharge was collected from this mine at the time of inspection. According to State information, the Solar Fuel No. 4 mine has a discharge and provides adequate treatment.

Below the area of mine discharges described above, Miller Run had pH and conductivity values of 3.1 and 1,000 micromhos/cm, respectively.

Several surface mines and an abandoned underground mine were located near the mouth of Miller Run. However, these mines contributed no drainage to Miller Run.

## CLEAR SHADE CREEK

Clear Shade Creek is unaffected by coal mine discharges. The only mine site located within the 31.4 square mile sub-watershed area was a surface mine high on the hillside along the south bank of the tributary. This surface mine also extends around the face of the hill and into the Dark Shade Creek drainage area. Most of this surface operation had been reclaimed and only a small active segment had not been reclaimed.

## SHADE CREEK

Discharge No. 5403 represents the first source of mine drainage inflow to Shade Creek below the confluence of Dark Shade Creek and Clear Shade Creek. The 24 gpm effluent actually represents the entire flow of a small wet weather tributary to Shade Creek. The upper end of the tributary was clear but near its confluence with Shade Creek it became noticeably discolored. The immediate area has been deep mined and perhaps some seepage is responsible for the discoloration of the intermittent tributary. The load discharged to Shade Creek was alkaline.

The discharge from Mine No. 5289 apparently resulted from a very old and covered drift mine. The only remaining evidence to suggest the presence of the mine is a refuse pile. A 12 gpm effluent emanating from the general area of the refuse pile carried an acid load of 31 lb/day.

Discharge No. 5402 contributed an acid load of 72 lb/day to Shade Creek. This effluent is actually another small intermittent tributary, similar to No. 5403, which becomes discolored near its confluence with Shade Creek.

## Roaring Fork

Roaring Fork was unaffected by coal mine discharges over most of its drainage area. In fact there were no coal mine operations above the small community of Arrow. At this point, Roaring Fork exhibited pH and conductivity values of 7.6 and 60 micromhos/cm, respectively. An abandoned and caved drift mine at Hagevo contributed the first source of mine drainage pollution in the Roaring Fork drainage area. The acid load discharged by this source (Mine No. 5551) was 165 lb/day. At the time of survey, there were several active surface mines in the Roaring Fork drainage area; however, they were dry. One additional underground mine opening was located, but it was also dry.

An active drift mine operated by Desort Coal Company was located near the mouth of Roaring Fork on the north bank of the tributary. The mine was dry.

Shade Creek below Roaring Fork

Two active drift mine operations were located on an unnamed tributary which enters Shade Creek on the west bank just north of Hillsboro. One of these mines was the Dalton Run No. 2 mine. The active portal was dry; however, a 20 gpm effluent discharged from a nearby caved drift opening. This was Mine No. 5281 and the acid load was 91 lb/day.

The second active mine was operated by the Potochar and Potochar Coal Company. The operation was dry at inspection and according to information supplied by the Pennsylvania Department of Environmental Resources, the mine is still active and dry at this time (fall 1971).

Several additional drift mine openings were found along the west bank of Shade Creek below the area mentioned above. However, these operations were dry at the time of inspection.

Four sources of abandoned mine drainage were located on an unnamed tributary which enters Shade Creek on the east bank immediately below the mouth of Spruce Run. A contour surface mine extends along the length of this unnamed tributary. Underground openings have also been developed within this surface mined area. Discharges from the unreclaimed strip mine spoil piles and drainage from the drift openings contributed a total source acid load of 105 lb/day.

## Spruce Run

The water quality of Spruce Run is degraded over nearly its entire length as a result of seepage areas occurring at the base of several surface mines. There were no significant point discharges at the time of inventory on Spruce Run. However, the water quality of the tributary gradually deteriorates to the point where the mouth of Spruce Run exhibited a pH value of 3.4. One drift mine was operated by the Hoffman Coal Company. The mine was dry when inspected and has since ceased operation.

## Shade Creek below Spruce Run

A long contour surface mine is located along the south bank of Shade Creek below the mouth of Spruce Run. This surface mine is in the vicinity of the abandoned No. 38 Mine of the Berwind White Coal Company. An active drift mine was in operation within the surface mine. Two discharges were collected from separate drainage points emanating from this mine. The total acid load discharged to Shade Creek was 93 lb/day. Several additional dry mine openings were found in the vicinity of the surface mine. These openings may have been part of the original No. 38 mine.

The mines described above were the last downstream sites found along the south bank of Shade Creek. There were no mine sites on the north bank of Shade Creek below Spruce Run.

At the time of survey, Shade Creek at the mouth carried an acid load ranging from 24,373 lb/day to 43,354 lb/day. (Table 34, Station No. 5381).

## PAINT CREEK

Much of the 37 square mile drainage area of Paint Creek has been subjected to extensive coal mine operations. Several of these operations were large underground mine complexes operated by the Berwind White Coal Company.

### Headwaters Area

The water quality in the headwaters area of Paint Creek was affected by an acid load of 292 lb/day resulting from cumulative seepage about the base of a strip mine. This was Mine No. 5304. The strip mine intersects the drainage divide separating the Little Conemaugh River and the Stony Creek drainage areas. Additional surface and several drift mines were located in this headwater area. However, these mines were dry or contributed only minor acid loads.

### Paint Creek-main stem

Four mine drainage discharges were located within a contour surface mine along the south bank of Paint Creek. This mine is approximately four miles in length and crosses Babcock Creek. The four discharge points all represent points of intersection between surface and underground mines. In addition to these sources, there were many other points of intersection which were dry at the time of inspection. The combined acid load discharged by the four sources (No.'s 5306, 5307, 5309, 5310) was 593 lb/day.

The abandoned No. 42 mine of the Berwind White Coal Company is located along the north bank of Paint Creek upstream of Babcock Creek. All the mine facilities have been removed or destroyed and only the sealed portal indicates the presence of Mine No. 42. A second opening to this mine was located on the south bank of Paint Creek in another (higher) coal seam. This portal was destroyed by the surface mine described above. At the time of inventory an active surface mine was in operation along the north bank of Paint Creek below Mine No. 42; however, the operation was dry.

The Berwind White No. 36 mine was located along the bank of Paint Creek just east of the town of Windber. At least six underground mine openings, including a sealed portal, and several large refuse piles are associated with the No. 36 complex. Two of the mine openings contributed significant acid discharges to Paint Creek. These were Mine No.'s 5311 and 5312. The combined acid loads were 536 lb/day.

## Seese Run

Seese Run is one of the three major tributaries to Paint Creek. Three underground mines and one combination surface and underground mine were located in the Seese Run drainage area. The combination mine was the only source of drainage. At this site, a 15 gpm effluent discharged from what remained of a drift opening intersected by the surface operation. The acid load from Mine No. 5314 was 97 lb/day.

### Weaver Run

Contour surface mines are located along both banks of Weaver Run in the headwaters area. These mines have intersected older underground operations and additional drift mine openings were developed in the highwall of the surface mine. Portions of the disturbed surface area have been reclaimed and other areas have been abandoned without reclamation. A combined acid load of 643 lb/day was discharged by four sources within this area. These were No.'s 5315, 5316, 5317, and 5319. An additional acid load of 47 lb/day was discharged by a test cut area separate from the above area.

### Paint Creek

Mine No. 5320 was the first contributing source of mine drainage below the confluence of Seese Run and Weaver Run with Paint Creek. A small refuse pile and a hillside indentation is all that remains to mark the site of this old drift mine. The acid load discharged to Paint Creek was 54 lb/day. A contour surface mine was located above Mine No. 5320 in a higher coal seam. However, at inspection, this mine was dry along i+s entire length.

An active drift mine was in operation along the south bank of Paint Creek, a short distance below Mine No. 5320. This small drift mine was operated by the Country Club Coal Company. The mine was dry at inspection and is presently operating under similar conditions.

A large abandoned mine discharge is located a short distance below the Country Club Mine. This was Mine No. 5380 located in a residential area within the small community of Paint. The measured effluent at this site was 956 gpm which carried an acid load of 3,556 lb/day.

Little Paint Creek

Little Paint Creek enters Paint Creek in the community of Scalp Level. Little Paint Creek is unaffected by mine drainage in the entire portion of the drainage area above Scalp Level. Two abandoned air shafts were found in this area but there were no sources of mine drainage discharge.

The Berwind White Coal Company operated a very large mine in Scalp Level until 1962. At that time, ownership was transferred to the Jandy Coal Company. Jandy Coal operates this mine at the present time. This operation is primarily involved in retreat mining and not advanced mining. As a result, the Commonwealth does not consider Jandy Coal responsible for the drainage emanating from the mine portal. At the time of inspection, an 84 gpm effluent was measured. This discharge carried an acid load of 514 lb/day (Mine No. 5191). Jandy Coal also operates the coal washery associated with this mine. During the course of field operations in the Scalp Level area, it was often observed that Little Paint Creek carried an excessive amount of coal fines. In at least one instance, these coal fines were traced to a discharge emanating from the coal washery (No. 5347).

Paint Creek below Little Paint Creek

The abandoned Eureka No. 30 Mine contributed an acid load of 70 lb/day. This mine (No. 5322) is located along the south bank of Paint Creek. Mine No. 5324 is another abandoned drift mine discharge located on the south bank. The acid load discharged by this source was 124 lb/day.

An active drift mine was in operation high on the hillside almost directly above abandoned Mine No. 5324. This active drift mine was the Shade Valley No. 5 Mine. The operation was dry at the time of inspection.

The Berwind White No. 37 Mine was located on the north bank of Paint Creek near the mouth of the tributary. Three sources of mine drainage discharge were located in the immediate vicinity of Mine No. 37. Two of these sources, No.'s 5328 and 5329, were located along the bank of Paint Creek. The combined acid load from these two sources was 1,056 lb/day.

The third mine opening was located on an unnamed tributary to Paint Creek. The discharge from this partially open mine mouth was 180 gpm which carried an acid load of 1,771 lb/day. (Mine No. 5327).

Stream sampling was conducted near the mouth of Paint Creek coincident with the mine drainage inventory. At that time, Paint Creek carried an acid load ranging from 14,372 lb/day to 30,055 lb/day. (Table 34, Station No. 5379).

## ACTIVE MINES

At the time of the Stony Creek study, approximately 40 coal mines were active in the watershed. The majority of these sites were dry surface mines located in the headwater areas of the watershed. A total of five active surface mines contributed drainage at the time of inspection. The combined acid load from these sources was 564 lb/day (Table 35). All but one of these discharges represented untreated drainage emanating directly from the active area of the operation. Discharge No. 5556 represents a treated effluent of cumulative seepage below a surface mined area. The mine had ceased operation and the area had been backfilled. After reclamation, two seepage areas had occurred below the backfilled area. This seepage was collected and treated prior to discharge to an unnamed tributary of Beaverdam Creek. The acid load carried by the treated effluent was 91 lb/day.

Four active underground mines contributed a total of six effluents. Two of these mines were responsible for two separate effluents. The combined acid load from these six sources was 5,846 lb/day. Treatment facilities have been installed on three of these effluents. They include No.'s 5287, 5378, and 5422.

## TABLE 35

Mine drainage loadings by receiving stream
Stony Creek

| Receiving Stream | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Stony Creek | 70 | 4,370 | 50,568 | 21,917 | 81,132 | 10,232 | 239 | 1,396 |
| Paint Creek | 19 | 1,621 | 8,170 | 9,398 | 17,695 | 399 | 101 | 236 |
| Little Paint Creek | 2 | 109 | 598 | 680 | 1,338 | 60 | 4 | 20 |
| Seese Run | 1 | 15 | 97 | 80 | 202 | 1 | 4 | 3 |
| Weaver Run | 5 | 161 | 690 | 377 | 684 | 17 | 10 | 27 |
| Shade Creek | 11 | 186 | 388 | 544 | 909 | 31 | 9 | 15 |
| Dark Shade Creek | 13 | 4,205 | 15,552 | 17,860 | 31,957 | 6,140 | 264 | 747 |
| Laurel Run | 4 | 180 | 3,561 | 485 | 1,979 | 415 | 12 | 61 |
| Miller Run | 4 | 103 | 319 | 438 | 693 | 44 | 8 | 7 |
| Roaring Fork | 2 | 60 | 178 | 70 | 221 | 3 | 4 | 8 |
| Solomon Run | 4 | 163 | 282 | 686 | 998 | 21 | 1 | 14 |
| Falls Run | 2 | 35 | 82 | 122 | 223 | 6 | 0 | 5 |
| Wells Creek | 6 | 671 | 2,714 | 2,966 | 4,814 | 158 | 46 | 70 |
| Oven Run | 4 | 44 | 459 | 96 | 733 | 54 | 16 | 10 |
| Bens Creek | 1 | 6 | 180 | 86 | 230 | 26 | 0 | 4 |
| South Fork Bens Creek | 8 | 1,303 | 3,527 | 8,600 | 11,969 | 305 | 21 | 38 |

Table 35 (continued)

Mine drainage loadings by receiving stream
Stony Creek

| Receiving Stream | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Soap Hollow Run | 2 | 1,384 | 4,949 | 7,718 | 17,606 | 346 | 56 | 92 |
| Reitz Creek | 2 | 40 | 267 | 326 | 551 | 25 | 8 | 6 |
| Schrock Run | 4 | 89 | 272 | 959 | 1,269 | 17 | 20 | 2 |
| Beaverdam Creek (Stony Creek) | 2 | 462 | 259 | 1,081 | 1,898 | 6 | 5 | 16 |
| Roaring Creek | 3 | 108 | 228 | 463 | 720 | 33 | 8 | 0 |
| Quemahoning | 12 | 586 | 2,007 | 3,471 | 6,745 | 269 | 41 | 25 |
| Higgins Run | 1 | 8 | -13 | 4 | 1 | 0 | 0 | 0 |
| Twomile Run | 5 | 31 | 313 | 103 | 407 | 12 | 6 | 17 |
| Lamberts Run | 3 | 318 | 747 | 1,264 | 2,015 | 78 | 38 | 12 |
| Boone Run | 3 | 66 | 289 | 686 | 1,010 | 41 | 5 | 4 |
| Beaverdam Creek (Quemahoning Creek) | 3 | 14 | 99 | 126 | 301 | 3 | 6 | 0 |
| Grove Run | 1 | 36 | 346 | 324 | 680 | 19 | 18 | 0 |
| Calenders Run | 1 | 12 | 55 | 47 | 108 | 0 | 5 | 1 |
| Clear Run | 1 | 15 | 127 | 234 | 383 | 0 | 7 | 0 |
| Totals | 199 | 16,461 | 97,310 | 81,211 | 188,971 | 18,761 | 962 | 2,836 |

Mine No. 5191 contributed an effluent of 84 gpm which carried an acid load of 514 lb/day. This effluent drains from the old Berwind White Mine at Scalp Level. This mine is now operated by the Jandy Coal Company. The Commonwealth does not consider Jandy responsible for the discharge and treatment is not required. Discharge No.'s 5296 and 5297 were collected at an active drift mine on Dark Shade Creek. This mine is also operating in old mine workings and is not considered responsible for the discharge.

One additional source of active drainage resulted from the preparation plant operated by Jandy Coal Company at Scalp Level. During the course of the field operations in the Scalp Level area, it was often observed that Little Paint Creek carried an excessive amount of coal fines. In at least one instance, these coal fines were traced to a discharge emanating from the coal washery (No. 5347). This effluent also carried an acid load of 84 lb/day.

A total of 199 discharging sources and approximately 5,700 acres of surface mined land were investigated during this study. Table 35 presents an area breakdown in terms of total flow and total loadings (lb/day) of polluting constituents discharged to receiving streams in the Stony Creek watershed. Table 36 presents a summary of flow volumes and chemical loadings by source type for the 199 discharging sources.

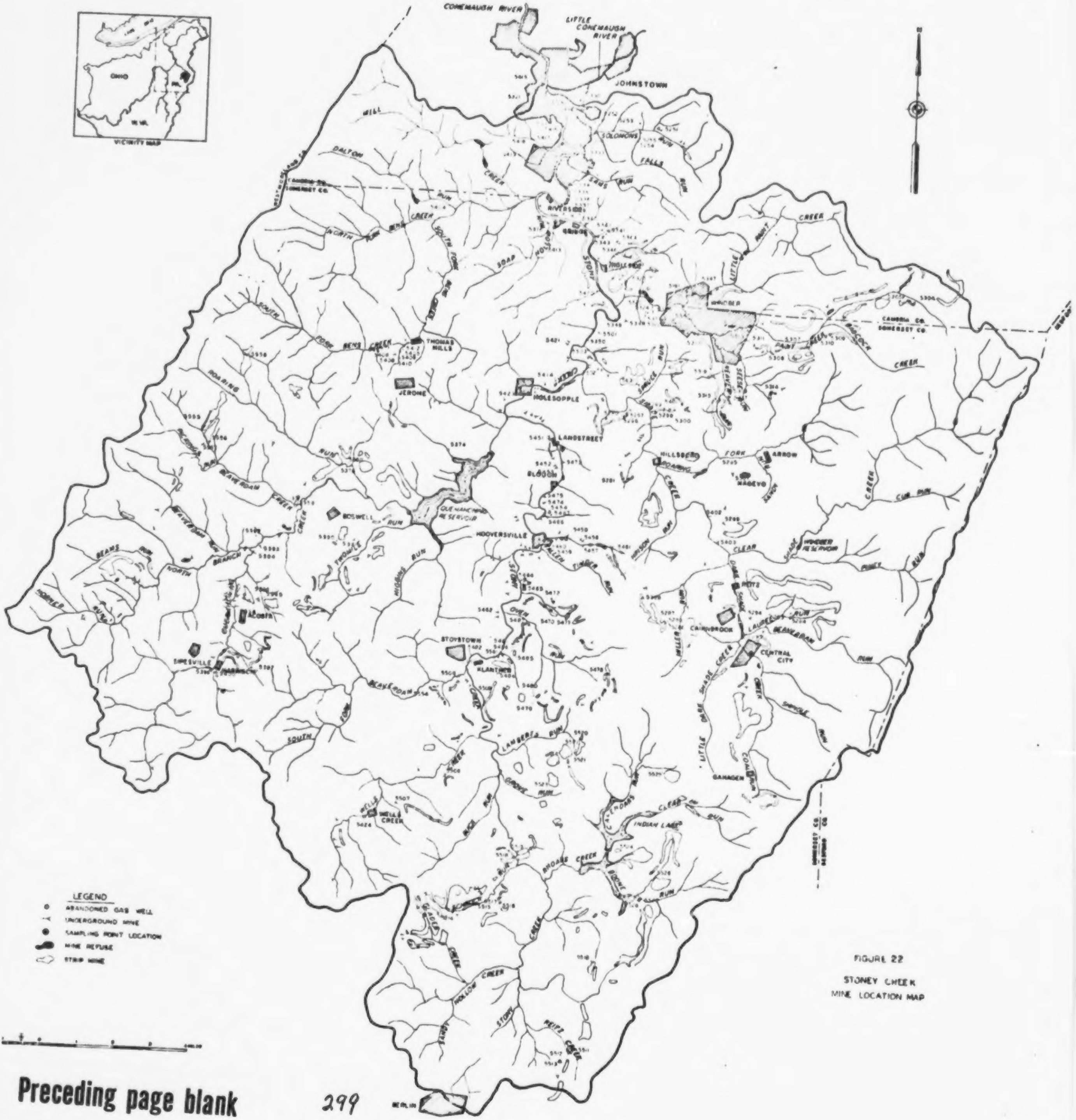

VICINITY MAP
OHIO
PA.
W. VA.
CONEMAUGH RIVER
LITTLE CONEMAUGH RIVER
JOHNSTOWN
SOLOMONS RUN
DALTON RUN
SAMS RUN
RIVERSIDE
CAMBRIA CO.
SOMERSET CO.
NORTH FORK BENS CREEK
SOUTH FORK BENS CREEK
THOMAS MILLS
JEROME
HOLSOPPLE
STONY CREEK
PAINT CREEK
BABCOCK CREEK
WINDBER
LANDSTREET
HILLSBORO
ARROW
BLOUGH
QUEMAHONING RESERVOIR
BOSWELL
HOOVERSVILLE
PAINT CREEK
SHADE CREEK
CLEAR SHADE CREEK
ROARING RUN
BEAVERDAM CREEK
NORTH BRANCH
BEAMS RUN
HOOVER RUN
JENNERS
SIPESVILLE
TWOMILE RUN
HIGGINS RUN
STOYSTOWN
KANTNER
CAIRNBROOK
CENTRAL CITY
LAUREL RUN
BEAVERDAM RUN
DARK SHADE CREEK
CUB RUN
LAMBERTS RUN
GARRETT RUN
WELLS CREEK
INDIAN LAKE
CALENDARS RUN
BROAD CREEK
GLADES CREEK
HOLLOW CREEK
STONY CREEK
BERLIN
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE

FIGURE 22

STONEY CREEK
MINE LOCATION MAP

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## Table 36

Mine drainage loadings by source type

Stony Creek

| Source Type | No. of Sources | Total Discharge (gpm) | Total Net Acidity (lb/day) | Total Hardness (lb/day) | Sulfate (lb/day) | Total Iron (lb/day) | Manganese (lb/day) | Aluminum (lb/day) |
|---|---|---|---|---|---|---|---|---|
| Drift Mines (abandoned) | 120 | 10,000 | 67,507 | 49,969 | 126,649 | 12,484 | 517 | 1,931 |
| Drift Mines (active) | 6 | 1,456 | 5,846 | 8,103 | 19,069 | 435 | 61 | 137 |
| Strip Mines (abandoned) | 32 | 651 | 3,247 | 3,097 | 6,050 | 197 | 105 | 92 |
| Strip Mines (active) | 5 | 281 | 584 | 1,370 | 2,008 | 28 | 31 | 1 |
| Combination Mines (abandoned) | 22 | 840 | 3,378 | 3,193 | 6,568 | 327 | 72 | 109 |
| Shaft Mines (abandoned) | 6 | 3,062 | 9,746 | 13,746 | 21,236 | 3,294 | 155 | 255 |
| Refuse Pile (abandoned) | 6 | 136 | 6,892 | 1,498 | 7,075 | 1,950 | 19 | 311 |
| Tunnel | 1 | 10 | 26 | 16 | 61 | 1 | 1 | 0 |
| Preparation Plant (active) | 1 | 25 | 84 | 219 | 255 | 45 | 1 | 0 |
| Totals | 199 | 16,461 | 97,310 | 81,211 | 188,971 | 18,761 | 962 | 2,836 |

## POLLUTION ABATEMENT

As shown in Table 36, drift mines were the principal sources of mine drainage pollution in the Stony Creek watershed. The total acid load discharged from these sources was more than 67,000 lb/day. Abandoned shaft mines and refuse piles also contributed significant acid loads.

Including all source types, a total of 13 principal sources of mine drainage discharge were located in the study area. These sources included ten drift mines, two shaft mines, and one coal refuse pile. These sources discharged a total acid load of 61,761 lb/day, about 63 percent of the acid load discharged by all 199 sources located during this survey.

A program of mine drainage pollution abatement in the Stony Creek watershed should give primary consideration to these thirteen sources. Although numerous and significant sources of mine drainage exist in the watershed, abatement of these sources without previous or concurrent abatement of the 13 principal sources, would not result in a major improvement in the stream water quality of Stony Creek.

However, even when effective drainage control can be established at the thirteen principal source sites, a residual acid load of more than 35,000 lb/day would still discharge to receiving streams in the Stony Creek watershed. This acid load would emanate from the large number of unabated sites remaining in the watershed. It would be expected that this residual acid loading would be of such magnitude that the stream water quality of Stony Creek would remain degraded to some degree by mine discharges. For this reason, any remedial program designed to significantly improve the water quality in all portions of the watershed, would have to consider more than the 13 principal source sites listed in this document.

There is insufficient stream water quality data available to accurately predict the effects upon stream water quality as a result of source abatement. Detailed engineering studies and long term water quality sampling at the source sites and at selected stream locations throughout the watershed may shift abatement priority from the listing in Table 37. Economic or technical constraints may also be responsible for a similar change. However, the initial emphasis can be placed upon the principal source sites until such a time that further study can recommend the addition or deletions of other sources.

The following is a description of the 13 principal sources recommended for abatement. These sources are listed in Table 37 and the mine site locations are shown in Figure 23. In the Stony Creek watershed, all mine drainage sources which discharged an acid load exceeding 1,000 lb/day are considered as principal sources. Mine No. 5378 was an active drift mine which contributed an acid load of 4,634 lb/day. Since treatment facilities have been installed at this mine, it is not considered as a principal source.

## Table 37

## Stony Creek Watershed

### Principal mine drainage sources

| Mine No. | Type of Mine | Flow (gpm) | pH | Specific[1/] Conductance | Acidity mg/1 | Acidity lb/day | Receiving Stream |
|---|---|---|---|---|---|---|---|
| 5211 | Refuse Pile | 20 | 1.8 | 8,000 | 12,000 | 2,880 | Laurel Run |
| 5215 | Shaft Mine (or drainway) | 2,889 | 6.9 | 1,000 | 200 | 6,934 | Dark Shade Creek |
| 5293 | Drift Mine | 875 | 3.1 | 2,900 | 430 | 4,515 | Dark Shade Creek |
| 5327 | Drift Mine | 180 | 2.7 | 3,000 | 820 | 1,771 | Paint Creek |
| 5333 | Drift Mine | 480 | 3.0 | 1,800 | 575 | 3,312 | Stony Creek |
| 5338 | Shaft Mine | 120 | 2.8 | 2,800 | 1,665 | 2,398 | Stony Creek |
| 5380 | Drift Mine | 956 | 3.9 | 1,500 | 310 | 3,556 | Paint Creek |
| 5411 | Drift Mine | 1,256 | 7.4 | 1,500 | 148 | 2,231 | South Fork Bens Creek |
| 5415 | Drift Mine | 630 | 4.1 | 6,000 | 3,550 | 26,838 | Stony Creek |
| 5427 | Drift Mine | 225 | 3.1 | 1,300 | 450 | 1,215 | Wells Creek |
| 5464 | Drift Mine | 141 | 3.0 | 2,700 | 735 | 1,244 | Stony Creek |
| 5502 | Drift Mine | 420 | 2.6 | 1,700 | 760 | 3,830 | Stony Creek |
| 5504 | Drift Mine | 270 | 3.6 | 1,000 | 320 | 1,037 | Stony Creek |
| TOTALS |  | 8,462 |  |  |  | 61,761 |  |

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[1/] Specific conductance measured as micromhos/cm.

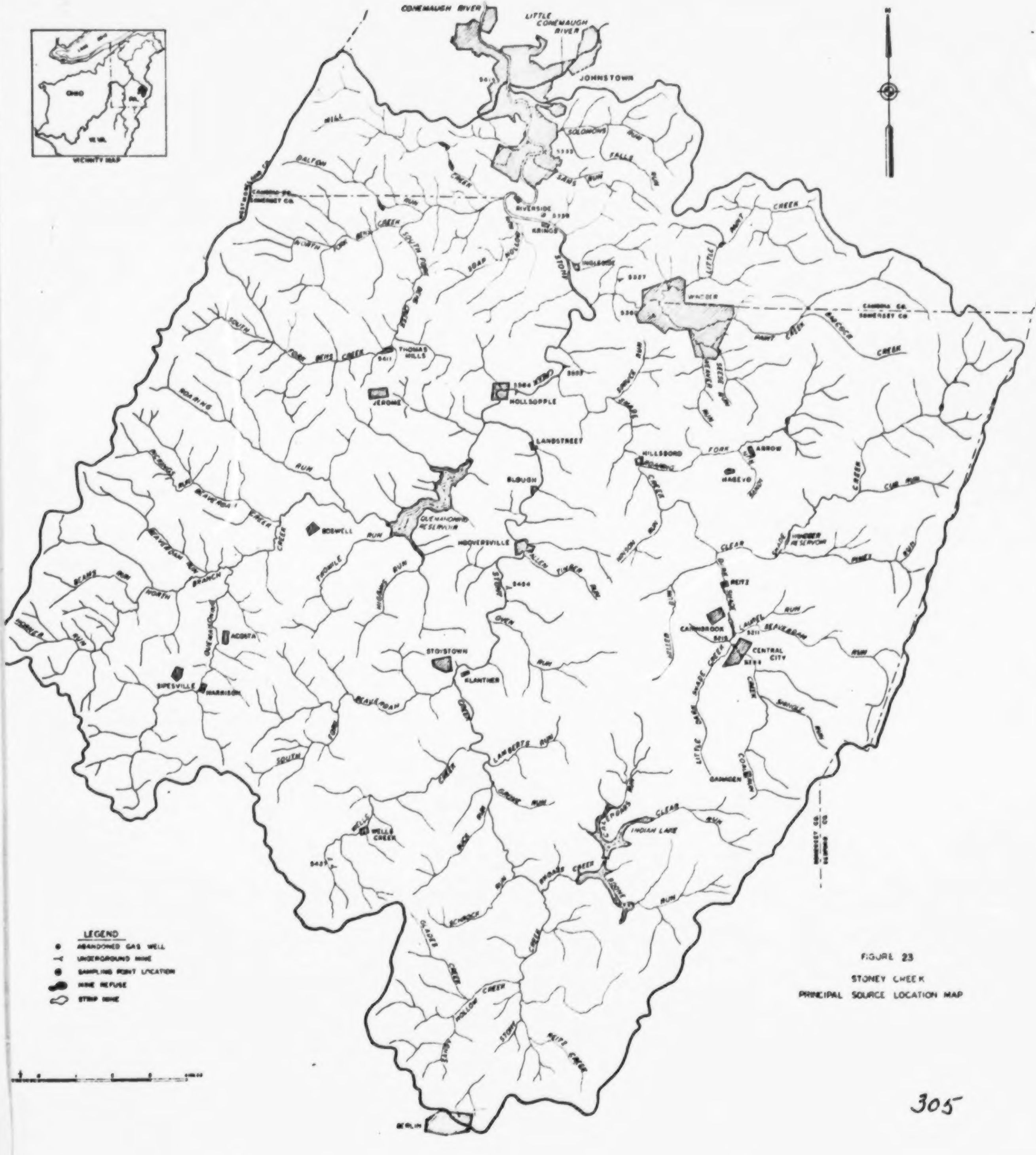
CONEMAUGH RIVER
LITTLE CONEMAUGH RIVER
JOHNSTOWN
SOLOMONS RUN
SAMS RUN
DALTON
RIVERSIDE
KRINGS
CAMBRIA CO.
SOMERSET CO.
NORTH FORK BENS CREEK
SOUTH FORK
STONY
INGLESIDE
WINDBER
PAINT CREEK
LITTLE PAINT CREEK
THOMAS MILLS
JEROME
HOLLSOPPLE
LANDSTREET
HILLSBORO
ARROW
SLOUGH
QUEMAHONING RESERVOIR
BOSWELL
HOOVERSVILLE
ALLEN TIMBER RUN
STOYSTOWN
KLANTHER
ACOSTA
SIPESVILLE
HARRISON
BEAVERDAM
NORTH BRANCH
REITZ
CAIRNBROOK
CENTRAL CITY
SHADE CREEK
LITTLE DARK SHADE CREEK
LAMBERTS RUN
CLEAR RUN
INDIAN LAKE
WELLS CREEK
GLADES CREEK
BERLIN
CAMBRIA CO.
SOMERSET CO.
BEDFORD CO.
SOMERSET CO.
VICINITY MAP
OHIO
W. VA.
LEGEND
ABANDONED GAS WELL
UNDERGROUND MINE
SAMPLING POINT LOCATION
MINE REFUSE
STRIP MINE

FIGURE 23

STONEY CREEK
PRINCIPAL SOURCE LOCATION MAP

## PRINCIPAL SOURCES

### Site No. 5211

The 20 gpm effluent sampled at this site represents a discharge from a swampy area just north of Central City. At this point, a considerable amount of coal refuse material is scattered about the general area. This refuse has, in places, resulted in the formation of several small impoundments within the swampy area. Leaching of this refuse has resulted in the production of highly mineralized water which seeps to Dark Shade Creek. Sample No. 5211 represents a cumulative discharge of this drainage. The acid load from this single source was 2,880 lb/day. There were numerous immeasurable seepage areas in this vicinity which contributes unknown amounts of acid to the receiving streams.

### Mine No. 5215

The 2,889 gpm effluent from this source was the largest mine drainage discharge in the Shade Creek watershed. The exact origin of the drainage is unknown. It may result from a shaft or borehole or may drain one of the numerous large drift mines which have been operative at one time in the Central City area. The discharge is located in a somewhat swampy area between the railroad tracks and Dark Shade Creek at a point just below the confluence of Little Dark Shade Creek and Shade Creek. The concrete structure from which the drainage emerges somewhat resembles a "pill box" approximately eight feet in width and two feet in height. Whatever the origin, the

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structure has quite obviously been constructed for the explicit purpose of draining a nearby mine. The acid load discharged to Dark Shade Creek was 6,934 lb/day.

Mine No. 5293

The drainage from this mine reportedly results from the abandoned Franklin No. 4 Mine in Central City. The preparation plant associated with this mine is still in operation. Surface mined coal from the surrounding area is trucked to the plant for preparation prior to being loaded in rail cars. The drainage flows from a culvert near the preparation plant and discharges to Dark Shade Creek directly behind the Central City Fire Station. The acid load was 4,515 lb/day.

Mine No. 5327

This mine is located approximately 0.3 mile northeast of the old Berwind White No. 37 Mine. It is assumed that Mine No. 5327 is associated with the Berwind operation. The discharge was 180 gpm which carried an acid load of 1,771 lb/day to an unnamed tributary of Paint Creek. The main portals at Mine No. 37 were dry.

Mine No. 5333

This mine is located on main stem Stony Creek about midway between the Johnstown suburbs of Moxham and Hornerstown. There are two mine openings at this site at a level just above the Johnstown and Stony Creek railroad tracks which parallel this section of Stony Creek. One of these openings is dry while the second discharged an effluent of 480 gpm directly to Stony Creek. The acid load from Mine No. 5333 was 3,312 lb/day.

### Mine No. 5338

The discharge at this mine site results from a shaft which was reportedly constructed to drain mine workings from a nearby mine. This 120 gpm discharge is located on the opposite bank of Stony Creek directly across from the small community of Krings. The mine or mines drained by this opening are probably drift mines developed in the coal seams outcropping along Stony Creek. The acid load discharged to main stem Stony Creek was 2,398 lb/day.

### Mine No. 5411

Mine No. 5411 is one of nine drift mines located along the South Fork of Bens Creek just above the community of Thomas Mill. Eight of these mines contribute drainage to the South Fork. Mine No. 5411 is by far the largest of these effluents. This mine is almost totally responsible for the grossly discolored appearance exhibited by the South Fork along its entire remaining downstream length. The acid load carried by this 1,256 gpm effluent was 2,231 lb/day.

### Mine No. 5415

The largest acid load in the entire 466 square mile drainage area of Stony Creek resulted from Mine No. 5415. This mine, as well as two additional openings, are located on the west bank hillside almost directly across from Point Park in downtown Johnstown. All three openings have been sealed; however, about 75 feet below one of the seals, a 630 gpm effluent discharged to Stony Creek. At the time of sampling, the acid load was 26,838 lb/day.

## Mine No. 5427

This mine is located near the headwaters of Wells Creek, a tributary to Stony Creek. There are two openings to the mine and both were discharging at the time of inspection. The combined effluent was 225 gpm which carried an acid load of 1,215 lb/day. The area immediately above the old openings has been surface mined.

## Mine No. 5464

This 141 gpm effluent drains from the old Wilber Mine on the east bank of Stony Creek south of Hooversville. At the time of inspection, this drainage was piped under Route 53 to the preparation facility of the Solar Fuel Company. An unknown portion of this drainage was lime treated by the Solar Fuel Company for use in their facility. The acid load carried by the entire untreated discharge as it emerges from the hillside was 1,244 lb/day. A second effluent of 8 gpm also discharges from the Wilber Mine. A salvage operator at the mine reported that the entire discharge from the mine was at one time piped under Route 53. However, due to a roof fall within the mine, a portion of the drainage is diverted and is not piped under the road bed. The acid load from this second source (No. 5465) was 69 lb/day.

Although not operating, the portals and air fan to this mine were still in tact and a considerable amount of mine equipment was on the site. Apparently, the mine had been worked to some extent until recently.

## Mine No. 5502

Mine No. 5502 is located along the east bank of Stony Creek just below the mouth of Shade Creek. A series of three drift mines are located along the hillside. Two of these were dry while the third (No. 5502) contributed a discharge of 420 gpm which carried an acid load of 3,830 lb/day.

## Mine No. 5504

This underground mine is located at the tip of a one mile contour surface mine. The surface mine apparently removed the coal outcropping along the hillside but did not cut into the older underground entry. However, the surface mine has probably created points of intersection with the underground mine voids. The discharge measured at the mine opening was 270 gpm which carried an acid load of 1,037 lb/day.

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# APPENDICES

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# APPENDIX A

## Stream water quality-survey findings, 1966

## Kiskiminetas River basin

| Station No. | Location | | No. of Samples | pH | Acidity (mg/1) | Alkalinity (mg/1) | Hardness (mg/1) | Sulfate (mg/1) | Total Iron (mg/1) | Manganese (mg/1) | Flow (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 490 | Rhoads Creek | Min. | | 6.5 | 0.0 | 13.0 | 76.0 | 34.0 | 0.0 | 0.1 | 8.4 |
| | @ Shanksville | Max. | 7 | 7.1 | 12.0 | 32.0 | 172.0 | 145.0 | 2.0 | 0.7 | 70.0 |
| | | Avg. | | | 6.7 | 19.6 | 136.1 | 106.0 | 0.6 | 0.4 | 19.9 |
| 492 | Clear Shade | Min. | | 6.2 | 3.0 | 5.0 | 7.0 | 4.0 | 0.0 | 0.0 | 1.5 |
| | Creek near | Max. | 7 | 7.8 | 10.0 | 15.0 | 60.0 | 25.0 | 1.0 | 0.2 | 83.0 |
| | mouth | Avg. | | | 6.7 | 9.9 | 34.0 | 12.9 | 0.2 | 0.1 | 17.7 |
| 493 | Dark Shade | Min. | | 2.8 | 107.0 | 0.0 | 148.0 | 48.0 | 7.5 | 0.2 | 9.6 |
| | Creek near | Max. | 7 | 4.4 | 445.0 | 0.0 | 363.0 | 825.0 | 73.2 | 8.2 | 50.0 |
| | Cairnbrook | Avg. | | | 270.3 | 0.0 | 260.3 | 501.4 | 46.7 | 5.1 | 20.5 |
| 494 | Shade Creek | Min. | | 2.7 | 53.0 | 0.0 | 86.0 | 120.0 | 6.7 | 0.1 | 9.0 |
| | @ Hillsboro | Max. | 7 | 3.8 | 255.0 | 0.0 | 332.0 | 490.0 | 22.1 | 6.0 | 120.0 |
| | | Avg. | | | 148.0 | 0.0 | 184.9 | 310.7 | 12.0 | 3.4 | 49.6 |
| 495 | Bens Creek | Min. | | 6.5 | 0.0 | 13.0 | 94.0 | 71.0 | 0.4 | 0.0 | 5.0 |
| | near mouth | Max. | 7 | 7.4 | 25.0 | 33.0 | 502.0 | 475.0 | 2.2 | 0.4 | 65.0 |
| | | Avg. | | | 9.0 | 22.9 | 297.9 | 284.4 | 1.3 | 0.2 | 18.9 |
| 499 | Yellow Creek | Min. | | 6.3 | 2.0 | 13.0 | 60.0 | 80.0 | 0.0 | 0.0 | 5.4 |
| | Route 259 | Max. | 7 | 7.2 | 12.0 | 43.0 | 285.0 | 135.0 | 1.0 | 0.2 | 116.0 |
| | Crossing | Avg. | | | 7.1 | 27.3 | 143.0 | 106.8(6)* | 0.3 | 0.1 | 26.2 |
| 501 | Tubmill Creek | Min. | | 3.2 | 9.0 | 0.0 | 60.0 | 36.0 | 3.1 | 0.0 | 10.5 |
| | near mouth | Max. | 7 | 6.0 | 105.0 | 12.0 | 127.0 | 194.0 | 12.2 | 0.8 | 40.0 |
| | | Avg. | | | 36.9 | 3.0 | 85.6 | 108.3 | 6.4 | 0.3 | 22.7 |
| 567 | Kiskiminetas | Min. | | 3.0 | 159.0 | 0.0 | 264.0 | 425.0 | 5.5 | 9.0 | 421.0 |
| | River-USGS | Max. | 6 | 3.6 | 259.0 | 0.0 | 454.0 | 700.0 | 32.6 | 76.9 | 1136.0 |
| | Gage @ Vandergrift | Avg. | | | 221.7 | 0.0 | 343.3 | 552.5(4) | 12.2 | 23.2 | 853.2 |

## APPENDIX A (Continued)

| Station No. | Location | | No. of Samples | pH | Acidity (mg/1) | Alkalinity (mg/1) | Hardness (mg/1) | Sulfate (mg/1) | Total Iron (mg/1) | Manganese (mg/1) | Flow (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 569 | Blacklegs | Min. | | 3.1 | 60.0 | 0.0 | 80.0 | 340.0 | 3.4 | 1.9 | 5.0 |
| | Creek near | Max. | 6 | 5.0 | 171.0 | 2.0 | 382.0 | 600.0 | 21.6 | 2.6 | 29.0 |
| | mouth | Avg. | | | 112.8 | 0.5 | 274.2 | 518.0(5) | 10.7 | 2.3 | 15.3 |
| 570 | Loyalhanna | Min. | | 3.3 | 104.0 | 0.0 | 125.0 | 120.0 | 2.4 | 4.1 | 60.0 |
| | Creek @ USGS | Max. | 6 | 4.7 | 193.0 | 0.0 | 500.0 | 680.0 | 18.5 | 8.2 | 296.0 |
| | Gage below | Avg. | | | 141.8 | 0.0 | 348.2 | 435.0(5) | 11.4 | 5.8 | 136.3 |
| | Loyalhanna Res. | | | | | | | | | | |
| 572 | Loyalhanna Cr. | Min. | | 6.7 | 5.0 | 12.0 | 21.0 | 0.0 | 0.0 | 0.0 | 16.5 |
| | @ U.S.Route 30 | Max. | 6 | 10.1 | 11.0 | 39.0 | 52.0 | 13.0 | 1.6 | 0.2 | 37.9 |
| | Bridge above | Avg. | | | 8.7 | 22.2 | 35.2(5) | 6.5(4) | 0.3 | 0.1 | 25.2 |
| | Ligonier | | | | | | | | | | |
| 573 | Blacklick Creek | Min | | 2.5 | 452.0 | 0.0 | 239.0 | 130.0 | 48.0 | 3.2 | 53.0 |
| | @ USGS Gage @ | Max. | 6 | 2.9 | 897.0 | 0.0 | 269.0 | 920.0 | 158.4 | 5.5 | 330.0 |
| | Josephine | Avg. | | | 601.5 | 0.0 | 248.8 | 522.5(4) | 93.8 | 4.0 | 125.2 |
| 574 | Two Lick Creek | Min. | | 3.0 | 189.0 | 0.0 | 222.0 | 130.0 | 27.8 | 1.2 | 21.0 |
| | @ USGS Gage | Max. | 6 | 4.3 | 467.0 | 0.0 | 381.0 | 750.0 | 40.8 | 5.7 | 86.0 |
| | near Graceton | Avg. | | | 308.7 | 0.0 | 284.0 | 528.0(5) | 34.7 | 3.8 | 50.3 |
| 575 | Conemaugh River | Min. | | 2.9 | 167.0 | 0.0 | 234.0 | 440.0 | 4.3 | 8.8 | 460.0 |
| | below Blairs- | Max. | 6 | 3.3 | 274.0 | 0.0 | 320.0 | 475.0 | 12.5 | 22.8 | 901.0 |
| | ville | Avg. | | | 207.3 | 0.0 | 274.5 | 456.3(4) | 7.8 | 15.1 | 724.8 |
| 576 | Blacklick Creek | Min. | | 2.7 | 614.0 | 0.0 | 247.0 | 1450.0 | 91.0 | 3.5 | 56.0 |
| | near Wehrum | Max. | 6 | 2.8 | 1592.0 | 0.0 | 410.0 | 2500.0 | 312.0 | 6.5 | 105.0 |
| | | Avg. | | | 999.8 | 0.0 | 311.2 | 1845.8 | 215.2 | 4.6 | 78.8 |
| 577 | North Branch | Min. | | 2.7 | 711.0 | 0.0 | 110.0 | 1150.0 | 163.2 | 2.9 | 21.0 |
| | Blacklick Creek | Max. | 6 | 2.9 | 1572.0 | 0.0 | 342.0 | 2500.0 | 374.4 | 7.0 | 47.5 |
| | @ U.S.Route 422 | Avg. | | | 1010.5 | 0.0 | 272.0(5) | 1720.0(5) | 257.1 | 5.2 | 35.4 |

## APPENDIX A (Continued)

| Station No. | Location | | No. of Samples | pH | Acidity (mg/1) | Alkalinity (mg/1) | Hardness (mg/1) | Sulfate (mg/1) | Total Iron (mg/1) | Manganese (mg/1) | Flow (cfs) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 578 | Two Lick Creek below Ramsey Run | Min. | | 3.0 | 95.0 | 0.0 | 202.0 | 50.0 | 1.4 | 2.6 | 8.0 |
| | | Max. | 6 | 5.2 | 261.0 | 2.0 | 414.0 | 450.0 | 11.5 | 5.9 | 42.0 |
| | | Avg. | | | 169.5 | 0.7 | 283.0 | 315.0 | 5.5(5) | 4.0 | 28.1 |
| 579 | Conemaugh River @ USGS Gage @ Seward | Min. | | 5.4 | 79.0 | 3.0 | 140.0 | 400.0 | 7.7 | 22.0 | 229.0 |
| | | Max. | 6 | 6.8 | 160.0 | 76.0 | 370.0 | 840.0 | 67.2 | 41.7 | 512.0 |
| | | Avg. | | | 106.5 | 19.3 | 257.8 | 580.0(5) | 22.0 | 29.8(5) | 373.3 |
| 580 | North Branch below Wilmor Dam (trib. to Little Conemaugh River | Min. | | 6.7 | 0.0 | 20.0 | 80.0 | 20.0 | 0.0 | 0.2 | 0.5 |
| | | Max. | 6 | 8.3 | 15.0 | 102.0 | 130.0 | 88.0 | 1.5 | 0.6 | 3.8 |
| | | Avg. | | | 4.0 | 71.5 | 95.2 | 49.6(5) | 0.5 | 0.3 | 2.4 |
| 581 | Little Conemaugh River below confluence of North & South Branchds | Min. | | 3.0 | 184.0 | 0.0 | 212.0 | 475.0 | 10.6 | 3.7 | - |
| | | Max. | 6 | 4.2 | 330.0 | 0.0 | 452.0 | 805.0 | 26.4 | 5.7 | 80.0 |
| | | Avg. | | | 244.2 | 0.0 | 336.3 | 598.0(5) | 17.8 | 4.4 | 40.9 |
| 583 | Quemahoning Creek near mouth | Min. | | 5.1 | 0.0 | 2.0 | 95.0 | 62.0 | 0.0 | 0.0 | 0.1 |
| | | Max. | 6 | 6.9 | 43.0 | 38.0 | 200.0 | 215.0 | 0.5 | 2.3 | 12.0 |
| | | Avg. | | | 17.0 | 20.3 | 145.8 | 147.4(5) | 0.2 | 1.1 | 3.9 |
| 585 | Stony Creek near Stoystown | Min. | | 6.6 | 5.0 | 12.0 | 187.0 | 155.0 | 0.0 | 0.2 | 14.5 |
| | | Max. | 6 | 7.0 | 16.0 | 28.0 | 237.0 | 235.0 | 0.5 | 0.7 | 30.0 |
| | | Avg. | | | 11.5 | 19.7 | 210.0 | 193.8(5) | 0.2 | 0.5 | 23.8 |

*( ) Indicates the number of samples used in averages when other than the maximum.

# APPENDIX B

## KISKIMINETAS RIVER, MAIN STEM AND MINOR TRIBUTARIES

## CODES FOR TABULAR DATA - PAGES B-1 THROUGH B-5

### TYPE

C - Combination Mine
D - Drift Mine
S - Strip Mine
R - Refuse Pile
O - Oil Well
A - Active Operations

### RECEIVING STREAM

1 - Wolford Run
2. Unnamed tribs to Wolford Run
3. Kiskiminetas River
4. Unnamed tribs to Kiskiminetas River
5. Beaver Run
6. Unnamed tribs to Beaver Run
7. Unnamed tribs to Porters Run
8. Thorn Run
9. Unnamed tribs to Thorn Run
10. Unnamed tribs to Long Run
11. Pine Run
12. Rattling Run
13. Sulphur Run
14. Sugar Hollow
15. Roaring Run
16. Guffy Run
17. Blacklegs Creek
18. Unnamed tribs to Blacklegs Creek
19. Big Run
20. Unnamed tribs to Big Run
21. Whiskey Run
22. Unnamed tribs to Whiskey Run

## KISKIMINETAS RIVER, MAIN STEM AND MINOR TRIBUTARIES

| Mine No | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5530 | S | 2 | 3.6 | 1500 | 5 | 590 | 35 | 475 | 29 | 920 | 55 | 9.8 | 0.6 | 9.0 | 0.5 | 33.2 | 2.0 |
| 5531 | S | 2 | 2.9 | 3500 | 3 | 1610 | 58 | 815 | 29 | 2250 | 81 | 14.6 | 0.5 | 58.7 | 2.1 | 123.7 | 4.5 |
| 5532 | S | 2 | 2.5 | 2400 | 2 | 1765 | 42 | 1040 | 25 | 2160 | 52 | 64.0 | 1.5 | 26.5 | 0.6 | 135.0 | 3.2 |
| 5534 | S | 1 | 2.3 | 3500 | 36 | 1762 | 761 | 490 | 212 | 1845 | 797 | 109.0 | 47.1 | 38.8 | 16.7 | 118.4 | 51.1 |
| 5533 | D | 2 | 2.3 | 4000 | 7 | 2650 | 223 | 525 | 44 | 2650 | 223 | 404.0 | 33.9 | 18.1 | 1.5 | 126.1 | 10.6 |
| 5535 | C | 1 | 2.6 | 5000 | 16 | 3100 | 595 | 555 | 107 | 3300 | 634 | 590.0 | 113.3 | 16.3 | 3.1 | 153.9 | 29.5 |
| 5536 | C | 2 | 2.4 | 3500 | 30 | 1940 | 698 | 344 | 124 | 1845 | 664 | 260.0 | 93.6 | 12.1 | 4.4 | 108.8 | 39.1 |
| 5537 | D | 2 | 2.3 | 3500 | 12 | 2770 | 399 | 396 | 57 | 2745 | 395 | 438.0 | 63.1 | 10.6 | 1.5 | 142.8 | 20.6 |
| 5538 | D | 4 | 2.6 | 2100 | 45 | 940 | 508 | 208 | 112 | 1000 | 540 | 45.6 | 24.6 | 11.1 | 6.0 | 47.8 | 25.8 |
| 5539 | C | 4 | 2.5 | 2500 | 5 | 1030 | 62 | 212 | 12 | 1110 | 67 | 31.6 | 1.9 | 9.5 | 0.6 | 67.8 | 3.8 |
| 5540 | O | 3 | 2.5 | 2400 | 7 | 800 | 67 | 219 | 18 | 960 | 81 | 44.4 | 3.7 | 2.9 | 0.2 | 40.2 | 3.4 |
| 5541 | D | 3 | 2.6 | 2900 | 40 | 630 | 302 | 448 | 215 | 1645 | 790 | 91.0 | 43.7 | 5.4 | 2.6 | 56.0 | 26.9 |
| 5542 | D | 3 | 3.2 | 6000 |  | 2060 | 99 | 636 | 31 | 4350 | 209 | 359.0 | 17.2 | 11.2 | 0.5 | 69.4 | 3.3 |
| 5543 | D | 3 | 3.0 | 3400 | 6 | 2030 | 146 | 556 | 40 | 2385 | 172 | 390.1 | 28.1 | 18.0 | 1.3 | 54.0 | 3.9 |
| 5544 | C | 6 | 2.8 | 1500 | 1 | 600 | 7 | 200 | 2 | 620 | 7 | 45.6 | 0.5 | 1.6 | 0.0 | 11.1 | 0.1 |
| 5545 | S | 6 | 2.8 | 2100 | 3 | 715 | 26 | 414 | 15 | 1225 | 44 | 15.3 | 0.6 | 18.3 | 0.7 | 61.4 | 2.2 |
| 5546 | C | 6 | 3.1 | 1500 | 24 | 900 | 259 | 608 | 175 | 720 | 207 | 38.4 | 11.1 | 5.9 | 1.7 | 15.6 | 4.5 |
| 5547 | D | 5 | 3.1 | 4000 | 10 | 2190 | 263 | 468 | 56 | 2900 | 348 | 564.0 | 67.7 | 10.8 | 1.3 | 87.0 | 10.4 |
| 5548 | C | 5 | 3.1 | 3900 | 110 | 2200 | 2904 | 348 | 459 | 2650 | 3498 | 412.0 | 543.8 | 10.6 | 14.0 | 81.2 | 107.2 |
| 5549 | S | 6 | 3.4 | 1500 | 8 | 430 | 41 | 307 | 29 | 740 | 71 | 91.1 | 8.7 | 30.6 | 2.9 | 12.5 | 1.2 |
| 5550 | S | 6 | 2.8 | 2600 | 10 | 985 | 118 | 665 | 80 | 1590 | 191 | 69.5 | 8.3 | 34.6 | 4.2 | 37.3 | 4.5 |
| 5601 | S | 6 | 3.6 | 1400 | 2 | 345 | 8 | 460 | 11 | 810 | 19 | 16.4 | 0.4 | 10.4 | 0.2 | 18.6 | 0.4 |
| 5602 | S | 7 | 3.3 | 2100 | 1 | 740 | 8 | 448 | 5 | 1325 | 16 | 20.5 | 0.2 | 38.4 | 0.5 | 37.0 | 0.4 |
| 5603 | S | 7 | 3.4 | 2850 | 1 | 615 | 7 | 500 | 11 | 1645 | 18 | 24.3 | 0.3 | 20.0 | 0.2 | 14.6 | 0.2 |

B-1-a

## KISKIMINETAS RIVER, MAIN STEM AND MINOR TRIBUTARIES

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5604 | R | 6 | 3.6 | 925 | 2 | 325 | 8 | 214 | 5 | 420 | 10 | 5.8 | 0.1 | 4.5 | 0.1 | 28.1 | 0.7 |
| 5605 | D | 8 | 2.6 | 3800 | 4 | 2480 | 119 | 540 | 26 | 2430 | 117 | 365.0 | 17.5 | 5.8 | 0.3 | 110.9 | 5.3 |
| 5606 | S | 9 | 2.6 | 3000 | 2 | 1600 | 38 | 420 | 10 | 1785 | 43 | 170.8 | 4.1 | 11.9 | 0.3 | 73.1 | 1.8 |
| 5607 | S | 9 | 3.0 | 3400 | 12 | 1350 | 194 | 500 | 72 | 1530 | 220 | 20.0 | 2.9 | 19.7 | 2.8 | 87.6 | 12.6 |
| 5608 | C | 11 | 3.4 | 3250 | 125 | 605 | 909 | 406 | 609 | 1360 | 2040 | 155.1 | 232.6 | 12.1 | 18.2 | 14.5 | 21.8 |
| 5609 | C | 11 | 4.5 | 3500 | 12 | 540 | 78 | 420 | 60 | 1395 | 201 | 291.1 | 41.9 | 4.4 | 0.6 | 7.4 | 1.1 |
| 5610 | C | 11 | 6.4 | 3500 | 12 | 700 | 101 | 352 | 5 | 1575 | 227 | 308.5 | 44.4 | 7.3 | 1.1 | 8.2 | 1.2 |
| 5611 | D | 11 | 6.1 | 5000 | 180 | 1300 | 2808 | 407 | 879 | 3050 | 6588 | 415.0 | 896.4 | 10.4 | 22.5 | 11.8 | 25.5 |
| 5612 | C | 9 | 2.4 | 5600 | 5 | 7400 | 444 | 2660 | 160 | 5125 | 308 | 1020.0 | 61.2 | 21.9 | 1.3 | 413.0 | 24.8 |
| 5613 | C | 9 | 2.6 | 5000 | 2 | 2830 | 68 | 590 | 14 | 2750 | 66 | 321.2 | 7.7 | 25.1 | 0.6 | 103.0 | 2.5 |
| 5614 | C | 9 | 3.3 | 2500 | 3 | 875 | 32 | 545 | 20 | 1230 | 44 | 8.2 | 0.3 | 34.0 | 1.2 | 43.0 | 1.5 |
| 5615 | C | 9 | 2.7 | 3500 | 4 | 1120 | 54 | 346 | 17 | 1260 | 60 | 76.0 | 3.6 | 7.3 | 0.4 | 53.2 | 2.6 |
| 5873 | D | 10 | 3.9 | 2500 | 4 | 500 | 24 | 632 | 30 | 990 | 48 | 47.3 | 2.3 | 10.1 | 0.5 | 12.4 | 0.6 |
| 5874 | D | 10 | 4.3 | 2200 | 1 | 410 | 5 | 454 | 5 | 925 | 11 | 8.5 | 0.1 | 3.8 | 0.0 | 11.6 | 0.1 |
| 5875 | C | 4 | 3.7 | 2600 | 3 | 650 | 23 | ---- | ---- | 930 | 33 | 9.5 | 0.3 | 3.6 | 0.1 | 26.9 | 1.0 |
| 5877 | C | 12 | 3.4 | 3400 | 34 | 635 | 259 | 1225 | 500 | 1305 | 532 | 48.4 | 19.7 | 13.1 | 5.3 | 13.0 | 5.3 |
| 5878 | D | 13 | 3.7 | 3000 | 1 | 1115 | 13 | 610 | 7 | 1400 | 17 | 102.0 | 1.2 | 17.2 | 0.2 | 48.6 | 0.6 |
| 5879 | D | 13 | 3.5 | 2700 | 15 | 1040 | 187 | 316 | 57 | 1155 | 208 | 98.0 | 17.6 | 7.5 | 1.4 | 46.0 | 8.3 |
| 5880 | D | 13 | 3.0 | 3000 | 12 | 1095 | 158 | 270 | 39 | 1295 | 186 | 74.3 | 10.7 | 15.0 | 2.2 | 49.3 | 7.1 |
| 5881 | D | 13 | 3.7 | 4000 | 8 | 1510 | 145 | 376 | 36 | 1400 | 134 | 68.7 | 6.6 | 17.7 | 1.7 | 58.9 | 5.7 |
| 5882 | D | 3 | 3.2 | 3000 | 12 | 1140 | 164 | 264 | 38 | 1260 | 181 | 164.9 | 23.7 | 3.0 | 0.4 | 45.9 | 6.6 |
| 5883 | D | 3 | 2.8 | 8000 | 80 | 5700 | 5472 | 968 | 929 | 5900 | 5664 | 986.0 | 946.6 | 49.1 | 41.1 | 365.0 | 350.4 |
| 5884 | R | 3 | 2.1 | 10,400 | 2 | 23,100 | 554 | 628 | 15 | 27,500 | 660 | 3758.0 | 90.2 | 545.0 | 13.1 | 948.0 | 22.8 |
| 5885 | D | 3 | 3.2 | 1600 | 2 | 400 | 10 | 145 | 3 | 400 | 10 | 11.9 | 0.3 | 2.0 | 0.0 | 27.0 | 0.6 |
| 5886 | D | 4 | 2.8 | 7000 | 1 | 9800 | 118 | 6460 | 78 | 8000 | 96 | 482.2 | 5.8 | 90.5 | 1.1 | 743.0 | 8.9 |

## KISKIMINETAS RIVER, MAIN STEM AND MINOR TRIBUTARIES

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5887 | R | 4 | 3.5 | 3700 | 5 | 1300 | 78 | 450 | 27 | 1485 | 89 | 175.2 | 10.5 | 9.1 | 0.5 | 40.0 | 2.4 |
| 5888 | R | 3 | 2.2 | 10,000 | 6 | 24,400 | 1757 | 5000 | 360 | 29,750 | 2142 | 3732.0 | 268.7 | 68.9 | 5.0 | 668.0 | 48.1 |
| 5889 | D | 3 | 2.9 | 6000 | 195 | 2750 | 6432 | 730 | 1708 | 3225 | 7547 | 581.0 | 1359.5 | 14.2 | 33.2 | 71.9 | 168.2 |
| 5890 | R | 3 | 3.1 | 13,600 | 2 | 34,300 | 8232 | 4000 | 96 | 40,500 | 972 | 6168.0 | 148.0 | 63.2 | 1.5 | 999.0 | 24.0 |
| 5891 | R | 3 | 2.6 | 5600 | 10 | 6100 | 732 | 660 | 79 | 5750 | 690 | 1256.0 | 150.7 | 86.3 | 10.4 | 353.0 | 42.4 |
| 5892 | R | 3 | 2.7 | 12,400 | 60 | 15,500 | 11,160 | 2000 | 1440 | 17,750 | 12,780 | 3197.0 | 2302.0 | 30.9 | 22.2 | 1014.0 | 730.1 |
| 5893 | R | 14 | 3.7 | 3500 | 5 | 1330 | 80 | 320 | 19 | 1125 | 68 | 129.9 | 7.8 | 14.7 | 0.9 | 67.6 | 4.1 |
| 5894 | D | 3 | 4.2 | 1900 | 60 | 250 | 180 | 105 | 76 | 475 | 342 | 7.6 | 5.5 | 1.2 | 0.9 | 9.3 | 6.7 |
| 5895 | D | 16 | 7.3 | 3000 | 162 | 235 | 457 | 147 | 236 | 1050 | 2040 | 34.9 | 67.8 | 2.1 | 4.1 | 8.0 | 15.6 |
| 5896 | D | 3 | 4.6 | 2000 | 72 | 277 | 239 | 134 | 116 | 425 | 367 | 4.9 | 4.2 | 3.0 | 2.6 | 15.9 | 13.7 |
| 5897 | D | 3 | 3.4 | 3500 | 20 | 510 | 122 | 200 | 48 | 1080 | 259 | 29.7 | 7.1 | 8.3 | 2.0 | 18.9 | 4.5 |
| 5898 | D | 3 | 3.4 | 8000 | 10 | 5600 | 672 | 490 | 59 | 5800 | 696 | 1017.0 | 122.0 | 16.2 | 1.9 | 344.0 | 41.3 |
| 5899 | D | 3 | 8.0 | 750 | 1 | 143 | 2 | 166 | 2 | 260 | 3 | 0.1 | 0.0 | 0.7 | 0.0 | 7.8 | 0.1 |
| 5871 | AD | 10 | 3.2 | 3250 | 400 | 700 | 3360 | 708 | 3398 | 1480 | 7104 | 27.9 | 133.9 | 8.1 | 38.9 | 11.0 | 52.8 |
| 5876 | AD | 15 | 3.7 | 2000 | 1 | 450 | 5 | 300 | 4 | 625 | 8 | 58.6 | 0.7 | 4.6 | 0.1 | 4.8 | 0.1 |
| 604 | D | 19 | 3.1 | 1800 | 324 | 450 | 1750 | 575 | 2236 | 700 | 2722 | 62.4 | 242.3 | 5.3 | 20.6 | 61.9 | 240.7 |
| 605 | D | 19 | 3.2 | 1600 | 675 | 425 | 3443 | 540 | 4374 | 640 | 5184 | 14.4 | 116.6 | 4.0 | 32.4 | 36.7 | 297.3 |
| 606 | D | 19 | 3.0 | 2000 | 60 | 625 | 450 | 388 | 279 | 875 | 630 | 15.6 | 11.2 | 3.3 | 2.4 | 61.9 | 44.6 |
| 607 | D | 20 | 3.8 | 860 | 0 | 50 | 0 | 452 | 0 | 380 | 0 | 0.2 | 0.0 | 5.7 | 0.0 | 3.1 | 0.0 |
| 608 | D | 20 | 2.7 | 3600 | 1 | 1800 | 22 | 648 | 8 | 2500 | 30 | 624.0 | 7.4 | 11.1 | 0.1 | 106.0 | 1.2 |
| 609 | S | 21 | 6.4 | 825 | 0 | 27 | 0 | 430 | 0 | 400 | 0 | 0.5 | 0.0 | 2.9 | 0.0 | 1.2 | 0.0 |
| 610 | S | 22 | 6.8 | 530 | 0 | 55 | 0 | 270 | 0 | 255 | 0.0 | 0.5 | 0.0 | 0.7 | 0.0 | 1.0 | 0.0 |
| 611 | S | 22 | 7.4 | 600 | 0 | -16 | 0 | 310 | 0 | 250 | 0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 |
| 621 | C | 22 | 3.7 | 1000 | 15 | 215 | 39 | 344 | 62 | 470 | 85 | 0.2 | 0.0 | 6.3 | 1.1 | 23.5 | 4.2 |
| 622 | C | 22 | 2.8 | 2400 | 1 | 825 | 10 | 368 | 4 | 1075 | 13 | 31.2 | 0.3 | 12.3 | 0.1 | 71.0 | 0.8 |

## KISKIMINETAS RIVER, MAIN STEM AND MINOR TRIBUTARIES

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 623 | C | 22 | 3.0 | 2200 | 2 | 835 | 20 | 360 | 9 | 1000 | 24 | 31.2 | 0.7 | 12.4 | 0.2 | 71.0 | 1.7 |
| 624 | S | 22 | 6.2 | 1200 | 1 | 61 | 1 | 176 | 2 | 675 | 8 | 0.0 | 0.0 | 13.8 | 0.1 | 2.1 | 0.0 |
| 625 | D | 22 | 3.5 | 2000 | 3 | 620 | 22 | 490 | 18 | 975 | 35 | 49.2 | 1.7 | 3.1 | 0.1 | 44.4 | 1.5 |
| 626 | C | 17 | 3.5 | 1800 | 9 | 475 | 51 | 450 | 49 | 800 | 85 | 7.2 | 0.7 | 6.7 | 0.7 | 41.8 | 4.5 |
| 627 | C | 22 | 3.9 | 1250 | 1 | 225 | 3 | 430 | 5 | 670 | 8 | 2.6 | 0.0 | 12.1 | 0.1 | 10.1 | 0.1 |
| 628 | C | 17 | 3.7 | 1300 | 1 | 450 | 5 | 280 | 3 | 540 | 6 | 2.9 | 0.0 | 3.6 | 0.0 | 18.6 | 0.2 |
| 629 | C | 22 | 3.5 | 1250 | 8 | 280 | 27 | 310 | 30 | 540 | 52 | 0.7 | 0.0 | 3.7 | 0.2 | 18.6 | 1.7 |
| 630 | C | 22 | 3.2 | 1600 | 7 | 465 | 39 | 336 | 28 | 700 | 59 | 37.2 | 3.1 | 5.6 | 0.4 | 32.6 | 2.7 |
| 631 | D | 22 | 3.3 | 1500 | 60 | 550 | 396 | 424 | 305 | 675 | 486 | 8.4 | 6.0 | 3.9 | 2.8 | 20.6 | 14.8 |
| 632 | D | 22 | 3.1 | 4000 | 1 | 1440 | 17 | 350 | 4 | 1900 | 23 | 32.4 | 0.3 | 33.3 | 0.3 | 161.0 | 1.9 |
| 633 | S | 22 | 3.5 | 2500 | 2 | 725 | 17 | 684 | 16 | 1300 | 31 | 14.9 | 0.3 | 42.3 | 1.0 | 32.2 | 0.7 |
| 634 | C | 21 | 3.4 | 1825 | 1 | 390 | 5 | 430 | 5 | 750 | 9 | 14.4 | 0.1 | 5.5 | 0.0 | 42.7 | 0.5 |
| 635 | C | 21 | 3.4 | 1700 | 1 | 355 | 4 | 352 | 4 | 620 | 7 | 6.0 | 0.0 | 4.9 | 0.0 | 39.4 | 0.4 |
| 636 | C | 21 | 3.5 | 1600 | 0 | 310 | 0 | 352 | 0 | 720 | 0 | 36.0 | 0.0 | 0.0 | 0.0 | 43.4 | 0.0 |
| 637 | C | 21 | 5.5 | 700 | 1 | 27 | 0 | 318 | 4 | 290 | 3 | 7.2 | 0.0 | 5.1 | 0.0 | 2.0 | 0.0 |
| 638 | S | 21 | 6.0 | 360 | 0 | -98 | 0 | 124 | 0 | 50 | 0 | 0.1 | 0.0 | 0.1 | 0.0 | 0.5 | 0.0 |
| 639 | S | 22 | 5.7 | 525 | 0 | 9 | 0 | 236 | 0 | 240 | 0 | 0.2 | 0.0 | 0.2 | 0.0 | 0.5 | 0.0 |
| 640 | S | 21 | 3.8 | 1400 | 0 | 410 | 0 | 236 | 0 | 675 | 0 | 2.8 | 0.0 | 38.1 | 0.0 | 25.3 | 0.0 |
| 644 | Sh | 18 | 7.0 | 2000 | 1008 | -267 | -3330 | 298 | 3605 | 625 | 7560 | 19.2 | 232.2 | 0.2 | 2.4 | 13.9 | 168.1 |
| 648 | D | 18 | 5.2 | 1500 | 3 | 282 | 10 | 586 | 21 | 780 | 29 | 1.0 | 0.0 | 22.4 | 0.8 | 18.7 | 0.6 |
| 649 | D | 18 | 3.4 | 2600 | 1 | 625 | 8 | 930 | 11 | 1050 | 13 | 79.2 | 0.9 | 21.2 | 0.2 | 50.9 | 0.6 |
| 650 | C | 18 | 3.3 | 1100 | 0 | 335 | 0 | 104 | 0 | 390 | 0 | 2.3 | 0.0 | 16.2 | 0.0 | 10.5 | 0.0 |
| 651 | C | 18 | 2.6 | 3000 | 0 | 1475 | 0 | 254 | 0 | 1400 | 0 | 21.8 | 0.0 | 36.9 | 0.0 | 150.7 | 0.0 |
| 652 | C | 18 | 3.8 | 240 | 0 | 30 | 0 | 72 | 0 | 50 | 0 | 0.4 | 0.0 | 1.5 | 0.0 | 2.4 | 0.0 |

## KISKIMINETAS RIVER, MAIN STEM AND MINOR TRIBUTARIES

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 633 | C | 18 | 3.7 | 200 | 0 | 42 | 0 | 26 | 0 | 60 | 0 | 0.1 | 0.0 | 15.0 | 0.0 | 3.0 | 0.0 |
| 634 | C | 18 | 3.3 | 700 | 0 | 150 | 0 | 68 | 0 | 200 | 0 | 0.0 | 0.0 | 3.2 | 0.0 | 10.6 | 0.0 |
| 635 | S | 18 | 4.1 | 120 | 0 | 15 | 0 | 38 | 0 | 40 | 0 | 0.0 | 0.0 | 1.2 | 0.0 | 0.5 | 0.0 |
| 636 | S | 18 | 3.6 | 2800 | 0 | 835 | 0 | 760 | 0 | 1260 | 0 | 2.4 | 0.0 | 50.4 | 0.0 | 76.4 | 0.0 |
| 660 | D | 18 | 2.9 | 3500 | 8 | 1295 | 124 | 1280 | 123 | 1600 | 154 | 108.0 | 10.3 | 63.7 | 6.1 | 118.0 | 11.3 |
| 661 | C | 18 | 3.2 | 2300 | 0 | 734 | 0 | 710 | 0 | 1110 | 0 | 3.6 | 0.0 | 54.0 | 0.0 | 2.3 | 0.0 |
| 5207 | D | 20 | 3.2 | 1600 | 310 | 435 | 1618 | 293 | 1090 | 740 | 2753 | 7.5 | 27.9 | 3.8 | 14.1 | 39.3 | 146.2 |

# APPENDIX C

## LOYALHANNA CREEK

## CODES FOR TABULAR DATA - PAGES C-1 THROUGH C-2

### TYPE

C - Combination Mines

D - Drift Mine

S - Strip Mine

R - Refuse Piles

Sh - Shaft or Slope Mine

CO - Coal Outcrop

### RECEIVING STREAM

1. Loyalhanna Creek
2. Unnamed tribs to Loyalhanna Cr.
3. Getty Run
4. Unnamed tribs to Getty Run
5. Crabtree Creek
6. Little Crabtree Creek
7. Keystone Run
8. Union Run
9. Saxman Run
10. Ninemile Run
11. Miller Run
12. Fourmile Run
13. Clark Hollow
14. Unnamed tribs to Mill Creek
15. Hannas Run
16. Unnamed tribs to Hannas Run
17. Whitethorn Creek

LOYALHANNA CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity |  | Hardness |  | Sulfate |  | Total Iron |  | Manganese |  | Aluminum |  |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
|  |  |  |  |  |  | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day |
| 2579 | C | 17 | 2.5 | 4000 | 2 | 3210 | 77 | 300 | 7 | 3200 | 77 | 519.0 | 12.5 | 8.3 | 0.2 | 204.8 | 4.9 |
| 5071 | D | 13 | 3.8 | 1040 | 2 | 430 | 10 | 138 | 3 | 530 | 13 | 4.9 | 0.1 | 2.3 | 0.0 | 32.8 | 0.8 |
| 5072 | D | 1 | 4.3 | 1540 | 12 | 880 | 127 | 240 | 35 | 1160 | 167 | 162.0 | 23.2 | 5.6 | 0.8 | 52.0 | 7.5 |
| 5073 | D | 11 | 4.6 | 600 | 37 | 60 | 27 | 196 | 87 | 275 | 122 | 1.5 | 0.7 | 1.4 | 0.6 | 7.8 | 3.5 |
| 5074 | Sh | 9 | 3.0 | 750 | 70 | 218 | 183 | 133 | 112 | 300 | 252 | 38.0 | 31.9 | 2.0 | 1.7 | 15.7 | 13.2 |
| 5075 | Sh | 9 | 2.8 | 1000 | 15 | 195 | 35 | 87 | 16 | 250 | 45 | 11.3 | 2.0 | 2.0 | 0.4 | 9.4 | 1.7 |
| 5163 | D | 4 | 2.8 | 1800 | 60 | 955 | 688 | 304 | 219 | 1300 | 936 | 82.0 | 59.0 | 7.9 | 5.7 | 50.8 | 36.6 |
| 5164 | D | 4 | 2.6 | 2200 | 45 | 1085 | 586 | 344 | 186 | 1400 | 756 | 150.0 | 81.0 | 9.2 | 4.9 | 51.2 | 27.6 |
| 5165 | R | 2 | 2.9 | 1500 | 3 | 665 | 24 | 172 | 6 | 740 | 27 | 7.0 | 0.1 | 3.5 | 0.1 | 57.9 | 2.1 |
| 5166 | C | 2 | 2.7 | 1400 | 24 | 305 | 88 | 252 | 73 | 440 | 127 | 3.0 | 0.9 | 3.1 | 0.9 | 16.5 | 4.8 |
| 5167 | C | 3 | 2.6 | 3000 | 8 | 1405 | 135 | 424 | 41 | 1925 | 185 | 104.0 | 9.9 | 11.3 | 1.0 | 75.4 | 7.2 |
| 5168 | S | 4 | 2.4 | 4250 | 3 | 2395 | 86 | 406 | 14 | 2500 | [illegible] | 340.0 | 12.2 | 28.4 | 1.0 | 114.8 | 4.1 |
| 5169 | D | 4 | 2.4 | 2800 | 3 | 1340 | 48 | 495 | 18 | 1400 | 56 | 166.0 | 6.0 | 10.9 | 0.4 | 69.6 | 2.5 |
| 5170 | D | 3 | 3.0 | 2500 | 240 | 1410 | 4060 | 444 | 1279 | 1740 | 5011 | 232.0 | 668.2 | 15.7 | 45.2 | 73.1 | 210.5 |
| 5171 | D | 3 | 2.9 | 3700 | 45 | 1740 | 940 | 430 | 222 | 2070 | 1118 | 35.0 | 18.9 | 14.7 | 7.9 | 79.7 | 40.0 |
| 5172 | D | 3 | 3.3 | 2600 | 3 | 1025 | 37 | 420 | 15 | 1470 | 53 | 24.0 | 0.8 | 10.8 | 0.4 | 54.9 | 1.9 |
| 5173 | D | 4 | 2.7 | 3250 | 50 | 1560 | 936 | 274 | 164 | 1880 | 1128 | 268.0 | 160.8 | 11.6 | 6.9 | 84.0 | 50.4 |
| 5174 | C | 4 | 2.7 | 3000 | 2 | 1470 | 35 | 278 | 7 | 1820 | 44 | 218.0 | 5.2 | 12.0 | 0.3 | 77.6 | 1.8 |
| 5175 | S | 4 | 2.8 | 2800 | 10 | 102[illegible] | 123 | 218 | 26 | 1280 | 154 | 56.0 | 6.7 | 10.0 | 1.2 | 64.6 | 7.8 |
| 5176 | D | 4 | 2.8 | 3000 | 25 | 1390 | 417 | 406 | 120 | 1925 | 578 | 15.2 | 4.6 | 17.5 | 5.3 | 68.0 | 20.4 |
| 5177 | Sh | 9 | 4.4 | 1250 | 2269 | 455 | 12,389 | 396 | 10,782 | 945 | 25,730 | 108.0 | 2940.0 | 7.4 | 201.5 | 15.8 | 430.2 |
| 5262 | S | 14 | 3.0 | 2000 | 0 | 430 | 0 | 414 | 0 | 675 | 0 | 17.3 | 0.0 | 5.5 | 0.0 | 17.6 | 0.0 |
| 5263 | S | 14 | 3.1 | 1800 | 105 | 360 | 454 | 496 | 625 | 840 | 1058 | 11.5 | 14.5 | 4.1 | 5.1 | 13.6 | 17.1 |
| 5264 | D | 14 | 2.7 | 1800 | 40 | 540 | 259 | 458 | 220 | 920 | 442 | 36.2 | 17.4 | 4.3 | 2.1 | 19.9 | 9.6 |
| 5265 | C | 15 | 6.3 | 1500 | 180 | -6 | -13 | 716 | 1547 | 600 | 1296 | 12.3 | 26.5 | 1.0 | 2.2 | 4.0 | 8.6 |
| 5266 | D | 16 | 4.5 | 1500 | 30 | 285 | 103 | 445 | 160 | 620 | 223 | 4.6 | 1.6 | 2.6 | 0.9 | 10.4 | 3.7 |

## LOYALHANNA CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/1 | Acidity lb/day | Hardness mg/1 | Hardness lb/day | Sulfate mg/1 | Sulfate lb/day | Total Iron mg/1 | Total Iron lb/day | Manganese mg/1 | Manganese lb/day | Aluminum mg/1 | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5267 | D | 16 | 4.2 | 2000 | 7 | 625 | 53 | 460 | 39 | 975 | 82 | 10.5 | 0.9 | 5.5 | 0.4 | 28.5 | 2.6 |
| 5268 | CD | 14 | 2.8 | 3000 | 3 | 965 | 35 | 555 | 20 | 1050 | 38 | 106.0 | 3.8 | 11.6 | 0.4 | 42.9 | 1.5 |
| 5269 | D | 16 | 2.8 | 2000 | 13 | 430 | 67 | 506 | 79 | 950 | 148 | 8.2 | 1.3 | 3.5 | 0.5 | 21.7 | 3.4 |
| 5270 | D | 16 | 2.9 | 1900 | 30 | 420 | 151 | 434 | 156 | 725 | 261 | 5.5 | 2.0 | 5.1 | 1.8 | 18.4 | 6.6 |
| 5271 | S | 16 | 4.1 | 1700 | 30 | 300 | 108 | 546 | 197 | 880 | 317 | 2.7 | 1.0 | 7.5 | 2.7 | 11.5 | 4.1 |
| 5272 | D | 16 | 5.9 | 1300 | 60 | 50 | 36 | 580 | 418 | 630 | 454 | 0.5 | 0.4 | 1.2 | 0.8 | 0.5 | 0.4 |
| 5273 | D | 16 | 7.4 | 1200 | 12 | -38 | -5 | 632 | 91 | 540 | 78 | 8.3 | 1.2 | 0.5 | 0.0 | 4.9 | 0.7 |
| 5274 | C | 16 | 7.8 | 1300 | 60 | -54 | -39 | 696 | 501 | 735 | 529 | 3.4 | 2.4 | 0.6 | 0.4 | 0.2 | 0.1 |
| 5275 | C | 16 | 3.5 | 1700 | 45 | 205 | 111 | 650 | 351 | 860 | 464 | 5.9 | 3.2 | 3.7 | 2.0 | 3.3 | 1.8 |
| 5301 | S | 8 | 2.8 | 2800 | 11 | 720 | 95 | 247 | 33 | 1180 | 145 | 64.0 | 8.4 | 16.3 | 2.1 | 32.8 | 4.3 |
| 5302 | S | 8 | 2.8 | 2020 | 17 | 650 | 133 | 320 | 65 | 985 | 189 | 68.0 | 13.9 | 9.0 | 1.8 | 26.2 | 4.9 |
| 5303 | R | 8 | 3.4 | 820 | 3 | 41 | 1 | 194 | 7 | 400 | 14 | 9.7 | 0.3 | 7.8 | 0.3 | 17.2 | 0.6 |
| 5351 | R | 10 | 2.7 | 4000 | 70 | 2295 | 1928 | 428 | 360 | 3250 | 2730 | 514.0 | 431.8 | 26.6 | 22.3 | 189.6 | 159.2 |
| 5352 | D | 12 | 2.6 | 8400 | 1 | 1410 | 17 | 900 | 11 | 11,000 | 132 | 980.0 | 11.7 | 600.0 | 7.2 | 954.0 | 11.4 |
| 5353 | S | 12 | 7.9 | 790 | 45 | -113 | -61 | 220 | 119 | 110 | 59 | 9.7 | 5.2 | 1.0 | 0.5 | 0.4 | 0.2 |
| 5354 | C | 6 | 2.9 | 2400 | 10 | 830 | 100 | 200 | 24 | 660 | 79 | 70.0 | 8.4 | 13.0 | 1.6 | 27.0 | 3.2 |
| 5355 | R | 5 | 4.1 | 1900 | 80 | 935 | 898 | 382 | 367 | 1225 | 1176 | 90.0 | 86.4 | 8.9 | 8.5 | 78.2 | 75.6 |
| 5356 | Sh | 5 | 7.4 | 2500 | 5097 | 320 | 19,572 | 872 | 53,335 | 1140 | 69,727 | 196.0 | 11,988 | 5.2 | 318.1 | 3.9 | 238.5 |
| 5357 | C | 2 | 2.6 | 2500 | 5 | 2015 | 121 | 366 | 22 | 2430 | 146 | 486.0 | 29.2 | 14.7 | 0.9 | 90.9 | 5.5 |
| 5358 | C | 2 | 3.9 | 700 | 2 | 110 | 3 | 97 | 2 | 130 | 3 | 1.7 | 0.0 | 1.3 | 0.0 | 6.8 | 0.2 |
| 5359 | D | 12 | 6.5 | 4000 | 22 | 935 | 247 | 1680 | 444 | 2900 | 766 | 574.0 | 151.5 | 60.0 | 15.8 | 3.9 | 1.0 |
| 5360 | Sh | 12 | 6.5 | 4000 | 10 | 835 | 100 | 1760 | 211 | 2500 | 300 | 436.0 | 52.3 | 30.4 | 3.6 | 3.0 | 0.4 |
| 5361 | Sh | 12 | 3.1 | 5000 | 70 | 1080 | 907 | 1792 | 1505 | 3740 | 3150 | 514.0 | 431.8 | 50.0 | 42.0 | 2.8 | 2.4 |
| 5362 | Sh | 12 | 3.2 | 5025 | 65 | 1070 | 835 | 1670 | 1303 | 3225 | 2516 | 392.0 | 256.6 | 72.0 | 56.2 | 1.6 | 1.2 |
| 5363 | Sh | 1 | 7.4 | 3700 | 62 | 575 | 428 | 1376 | 1024 | 2150 | 1600 | 296.0 | 220.2 | 25.2 | 18.7 | 1.0 | 0.7 |
| 5364 | Sh | 1 | 7.4 | 3700 | 1990 | 730 | 17,432 | 1080 | 25,790 | 1935 | 46,208 | 344.0 | 8214.7 | 28.0 | 668.6 | 2.1 | 50.1 |
| 5500 | D | 7 | 2.7 | 1100 | 62 | 377 | 280 | 518 | 385 | ---- | ---- | 75.2 | 55.9 | 3.0 | 2.2 | 18.2 | 13.5 |

# APPENDIX D

## CONEMAUGH RIVER, MAIN STEM AND MINOR TRIBUTARIES

**Codes for Tabular Data - Pages D-1 Through D-2**

### TYPE

C. Combination Mine
D. Drift Mines
S. Strip Mines
R. Refuse Piles
Sh. Shaft Mine
A. Active

### RECEIVING STREAM

1. Conemaugh River
2. Unnamed tribs to Conemaugh River
3. Aultmans Run
4. Unnamed tribs to Altmans Run
5. Reeds Run
6. Unnamed tribs to Reeds Run.
7. Neal Run
8. Coal Run
9. McGee Run
10. Freeman Run
11. Tubmill Creek
12. Unnamed tribs to Hypocrite Creek
13. St. Clair Run
14. East Branch Richards Run
15. West Branch Richards Run
16. Hinckston Run

## CONEMAUGH RIVER

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/1 | Acidity lb/day | Hardness mg/1 | Hardness lb/day | Sulfate mg/1 | Sulfate lb/day | Total Iron mg/1 | Total Iron lb/day | Manganese mg/1 | Manganese lb/day | Aluminum mg/1 | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5180 | D | 16 | 6.5 | 1400 | 72 | -117 | -101 | 790 | 683 | 870 | 752 | 2.0 | 1.7 | 1.8 | 1.6 | 0.3 | 0.3 |
| 5181 | D | 1 | 7.1 | 580 | 3 | -31 | -1 | 415 | 15 | 315 | 11 | 7.7 | 0.3 | 0.7 | 0.0 | 0.2 | 0.0 |
| 5182 | D | 1 | 4.0 | 2900 | 90 | 1390 | 150 | 406 | 438 | 1715 | 1852 | 400.0 | 432.0 | 4.7 | 5.1 | 60.6 | 65.4 |
| 5183 | R | 15 | 3.5 | 7300 | 2 | 11,400 | 274 | 550 | 13 | 10,400 | 250 | 1420.0 | 34.1 | 74.0 | 1.8 | 1003.0 | 24.1 |
| 5184 | D | 15 | 3.4 | 2200 | 15 | 650 | 117 | 545 | 98 | 1175 | 212 | 113.0 | 20.3 | 2.2 | 0.4 | 15.4 | 2.8 |
| 5185 | D | 14 | 6.7 | 1700 | 207 | 4 | 10 | 690 | 1714 | 900 | 2236 | 574.0 | 1425.8 | 1.3 | 3.2 | 0.2 | 0.5 |
| 5186 | D | 14 | 3.6 | 3500 | 2 | 1620 | 39 | 424 | 10 | 2160 | 52 | 346.0 | 8.3 | 2.8 | 0.1 | 47.4 | 1.1 |
| 5192 | D | 2 | 2.3 | 3000 | 2 | 1810 | 43 | 466 | 11 | 2065 | 50 | 332.0 | 8.0 | 5.0 | 0.1 | 80.5 | 1.9 |
| 5193 | D | 2 | 2.5 | 6000 | 2 | 4400 | 106 | 500 | 12 | 4500 | 108 | 805.0 | 19.3 | 16.0 | 0.4 | 189.0 | 4.5 |
| 5194 | D | 2 | 2.7 | 4000 | 5 | 945 | 57 | 760 | 46 | 1000 | 60 | 78.0 | 4.7 | 5.5 | 0.3 | 33.1 | 2.0 |
| 5195 | D | 2 | 2.7 | 5000 | 9 | 2925 | 316 | 394 | 43 | 3300 | 356 | 804.0 | 86.8 | 7.2 | 0.8 | 122.5 | 13.2 |
| 5196 | D | 1 | 2.6 | 3000 | 3 | 605 | 22 | 402 | 14 | 665 | 24 | 760.0 | 27.4 | 2.1 | 0.1 | 34.8 | 1.8 |
| 5197 | D | 2 | 2.7 | 3750 | 1 | 1820 | 22 | 282 | 3 | 1620 | 19 | 210.0 | 2.5 | 2.1 | 0.0 | 125.8 | 1.5 |
| 5198 | D | 2 | 2.4 | 3500 | 3 | 1475 | 53 | 249 | 9 | 1215 | 44 | 140.0 | 5.0 | 26.7 | 1.0 | 69.4 | 2.5 |
| 5199 | R | 8 | 2.3 | 7400 | 2 | 8950 | 215 | 1890 | 45 | 9875 | 237 | 1657.0 | 39.8 | 46.4 | 1.1 | 508.0 | 12.2 |
| 5258 | S | 16 | 3.3 | 260 | 0 | 40 | 0 | 34 | 0 | 60 | 0 | 1.8 | 0.0 | 0.7 | 0.0 | 2.0 | 0.0 |
| 5277 | D | 12 | 3.3 | 1100 | 15 | 83 | 15 | 610 | 110 | 690 | 124 | 0.6 | 0.1 | 3.0 | 0.5 | 2.9 | 0.5 |
| 5278 | D | 11 | 2.6 | 1600 | 185 | 945 | 2098 | 156 | 346 | 1140 | 2531 | 300.0 | 666.0 | 1.6 | 3.6 | 32.1 | 71.3 |
| 5365 | D | 13 | 2.6 | 5250 | 3 | 3360 | 121 | 260 | 9 | 3900 | 140 | 476.0 | 17.1 | 8.8 | 0.3 | 213.3 | 7.7 |
| 5366 | Sh | 1 | 2.7 | 2400 | 300 | 985 | 3546 | 111 | 400 | 899 | 3240 | 136,0 | 489.6 | 7.3 | 26.3 | 49.2 | 177.1 |
| 5367 | D | 1 | 2.6 | 6000 | 17 | 3400 | 694 | 2380 | 486 | 3225 | 658 | 660.0 | 134.6 | 5.0 | 1.0 | 125.6 | 25.6 |
| 5368 | D | 11 | 3.0 | 2400 | 30 | 970 | 349 | 172 | 62 | 1050 | 378 | 231.0 | 83.2 | 3.3 | 1.2 | 39.0 | 14.0 |

CONEMAUGH RIVER

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity | | Hardness | | Sulfate | | Total Iron | | Manganese | | Aluminum | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | mg/1 | 1b/day | mg/1 | 1b/day | mg/1 | 1b/day | mg/1 | 1b/day | mg/1 | 1b/day | mg/1 | 1b/day |
| 5369 | D | 11 | 2.6 | 5750 | 15 | 3150 | 567 | 350 | 63 | 3525 | 635 | 1020.0 | 183.6 | 4.7 | 0.8 | 95.7 | 17.2 |
| 5370 | D | 10 | 2.6 | 4000 | 11 | 3250 | 429 | 204 | 27 | 2725 | 360 | 308.0 | 40.7 | 2.2 | 0.3 | 11.4 | 1.5 |
| 5371 | D | 1 | 4.2 | 3000 | 1710 | 855 | 17,545 | 590 | 12,107 | 1295 | 26,573 | 340.0 | 6976.8 | 12.0 | 246.2 | 9.8 | 201.1 |
| 5372 | D | 1 | 3.2 | 2200 | 5 | 525 | 32 | 356 | 21 | 600 | 36 | 4.8 | 0.3 | 7.1 | 0.4 | 6.6 | 0.4 |
| 5373 | R | 9 | 3.5 | 950 | 150 | 215 | 387 | 155 | 279 | 280 | 504 | 3.6 | 6.5 | 3.4 | 6.1 | 13.1 | 23.6 |
| 5529 | D | 1 | 6.8 | 4500 | 22 | 775 | 207 | 536 | 142 | 2250 | 594 | 291.0 | 76.8 | 7.4 | 2.0 | 0.3 | 0.1 |
| 5562 | R | 6 | 3.4 | 6400 | 3 | 6250 | 225 | 1075 | 39 | 7625 | 275 | 2.1 | 0.1 | 140.0 | 5.0 | 249.2 | 9.0 |
| 5563 | R | 7 | 2.3 | 10,600 | 12 | 25,000 | 3600 | 18,080 | 2604 | 24,000 | 864 | 680.0 | 24.5 | 144.8 | 5.2 | 1800.0 | 64.8 |
| 5564 | R | 5 | 3.2 | 6000 | 45 | 3850 | 2079 | 630 | 340 | 4350 | 2349 | 1235.0 | 666.9 | 35.8 | 19.3 | 120.6 | 65.1 |
| 5565 | C | 6 | 3.8 | 1400 | 5 | 270 | 162 | 246 | 15 | 435 | 26 | 16.9 | 1.0 | 3.3 | 0.2 | 7.3 | 0.4 |
| 5566 | S | 6 | - | 6000 | 48 | 2825 | 1627 | 1010 | 582 | 3150 | 1814 | 177.0 | 102.0 | 38.7 | 22.3 | 159.7 | 92.0 |
| 5567 | S | 6 | 3.9 | 750 | 12 | 132 | 19 | 141 | 20 | 180 | 26 | 2.2 | 0.3 | 10.8 | 1.6 | 2.8 | 0.4 |
| 5568 | S | 4 | 4.5 | 1200 | 20 | 204 | 49 | 256 | 61 | 390 | 94 | 1.7 | 0.4 | 3.1 | 0.7 | 7.2 | 1.7 |
| 5569 | S | 3 | 4.2 | 2500 | 0 | 240 | 0 | 655 | 0 | 870 | 0 | 14.1 | 0.0 | 2.6 | 0.0 | 9.7 | 0.0 |
| 5570 | S | 3 | 7.1 | 2800 | 0 | 176 | 0 | 524 | 0 | 663 | 0 | 3.4 | 0.0 | 5.7 | 0.0 | 0.0 | 0.0 |
| 5200 | AD | 8 | 7.0 | 2000 | 4 | -17 | -8 | 600 | 29 | 1000 | 48 | 6.5 | 0.3 | 0.7 | 0.0 | 1.3 | 0.1 |

# APPENDIX E

## BLACKLICK CREEK

Codes for Tabular Data - Pages E-1 Through E-6

| Type | Receiving Stream |
|---|---|
| C - Combination Mines | 1 - Blacklick Creek |
| D - Drift Mines | 2 - Unnamed tribs to Blacklick Creek |
| S - Strip Mines | 3 - Unnamed tribs to Muddy Run |
| Sh - Shaft Mines | 4 - Weir's Run |
| R - Refuse Piles | 5 - Laurel Run |
| A - Active | 6 - Unnamed tribs to Laurel Run |
| | 7 - Ramsey Run |
| | 8 - Unnamed tribs to Ramsey Run |
| | 9 - Mardis Run |
| | 10 - Aulds Run |
| | 11 - Unnamed tribs to Aulds Run |
| | 12 - Unnamed tribs to Rummel Run |
| | 13 - South Branch Blacklick Creek |
| | 14 - Unnamed tribs to South Branch Blacklick Creek |
| | 15 - Brush Creek |
| | 16 - Coal Pit Run |
| | 17 - Crooked Run |
| | 18 - Dutch Run |
| | 19 - Unnamed tribs to Hill Creek |
| | 20 - Elk Creek |

E-1-a

## BLACKLICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity | | Hardness | | Sulfate | | Total Iron | | Manganese | | Aluminum | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day |
| 4237 | C | 5 | 3.1 | 500 | 30 | 105 | 38 | 67 | 24 | 135 | 49 | 2.9 | 1.0 | 1.7 | 0.6 | 4.5 | 1.6 |
| 4450 | S | 11 | 3.4 | 1300 | 40 | 142 | 68 | 124 | 60 | 375 | 180 | 0.7 | 0.3 | 4.7 | 2.3 | 7.9 | 3.8 |
| 4540 | S | 5 | 3.3 | 220 | 0 | 64 | 0 | 72 | 0 | 60 | 0 | 0.5 | 0.0 | 2.1 | 0.0 | 2.0 | 0.0 |
| 4543 | R | 13 | 2.7 | 6000 | 3 | 4150 | 149 | 745 | 27 | 4875 | 176 | 244.0 | 8.8 | 36.0 | 1.3 | 225.5 | 8.1 |
| 4544 | R | 13 | 2.7 | 8000 | 2 | 6025 | 145 | 960 | 23 | 7600 | 182 | 615.0 | 14.8 | 43.5 | 1.0 | 395.0 | 9.5 |
| 4545 | R | 13 | 2.7 | 8000 | 3 | 6650 | 239 | 960 | 36 | 8100 | 292 | 455.0 | 16.4 | 92.5 | 3.3 | 299.0 | 10.8 |
| 4546 | R | 13 | 3.4 | 3250 | 20 | 2185 | 524 | 218 | 52 | 2040 | 490 | 1.5 | 0.4 | 10.7 | 2.6 | 245.5 | 58.9 |
| 4743 | R | 1 | 3.0 | 650 | 50 | 96 | 58 | 44 | 26 | 125 | 75 | 9.3 | 5.6 | 1.0 | 0.6 | 2.8 | 1.7 |
| 4744 | R | 1 | 3.8 | 180 | 4 | 77 | 4 | 26 | 1 | 35 | 2 | 4.8 | 0.2 | 0.2 | 0.0 | 0.5 | 0.0 |
| 4745 | R | 1 | 3.4 | 1600 | 135 | 560 | 907 | 30 | 49 | 540 | 875 | 89.9 | 145.6 | 0.5 | 0.8 | 21.6 | 35.0 |
| 4746 | Sh | 8 | 3.6 | 2800 | 1020 | 925 | 11,322 | 256 | 3133 | 1015 | 12,424 | 134.1 | 1641.4 | 4.9 | 60.0 | 54.2 | 663.4 |
| 4748 | D | 2 | 3.5 | 1900 | 60 | 580 | 418 | 120 | 86 | 850 | 612 | 76.3 | 54.9 | 1.9 | 1.4 | 29.7 | 21.4 |
| 4750 | D | 14 | 2.3 | 3700 | 3 | 1860 | 67 | 290 | 10 | 1845 | 66 | 435.0 | 15.7 | 4.3 | 0.2 | 48.3 | 1.7 |
| 4772 | D | 3 | 2.6 | 2000 | 10 | 620 | 74 | 296 | 36 | 975 | 117 | 15.8 | 1.9 | 6.3 | 0.8 | 33.5 | 4.0 |
| 4773 | D | 3 | 2.5 | 1900 | 20 | 490 | 118 | 525 | 126 | 1125 | 270 | 5.0 | 1.2 | 4.6 | 1.1 | 20.0 | 4.8 |
| 4774 | D | 2 | 2.4 | 1400 | 3 | 415 | 15 | 144 | 5 | 600 | 22 | 5.4 | 0.2 | 9.8 | 0.4 | 21.6 | 0.8 |
| 4793 | R | 14 | 2.6 | 1300 | 9 | 181 | 20 | 136 | 15 | 255 | 28 | 2.9 | 0.3 | 0.8 | 0.1 | 11.6 | 1.3 |
| 4794 | D | 14 | 2.7 | 1200 | 60 | 225 | 162 | 109 | 78 | 270 | 194 | 5.1 | 3.7 | 0.6 | 0.4 | 10.9 | 7.8 |
| 4795 | D | 14 | 2.7 | 1650 | 100 | 155 | 186 | 74 | 89 | 400 | 480 | 15.3 | 18.4 | 2.5 | 3.0 | 15.3 | 18.4 |
| 4796 | S | 14 | 2.9 | 1100 | 7 | 239 | 20 | 50 | 4 | 255 | 21 | 2.5 | 0.2 | 2.6 | 0.2 | 14.6 | 1.2 |
| 4797 | C | 14 | 2.6 | 2400 | 5 | 565 | 34 | 59 | 4 | 510 | 31 | 7.3 | 0.4 | 3.8 | 0.2 | 28.4 | 1.7 |
| 4798 | D | 14 | 3.4 | 320 | 0 | 92 | 0 | 58 | 0 | 55 | 0 | 0.7 | 0.0 | 1.5 | 0.0 | 4.7 | 0.0 |
| 4799 | D | 14 | 7.8 | 110 | 100 | 79 | 95 | 22 | 26 | 5 | 6 | 0.1 | 0.1 | 0.0 | 0.0 | 2.0 | 2.4 |
| 4800 | D | 3 | 2.7 | 1300 | 5 | 428 | 26 | 258 | 15 | 675 | 41 | 8.8 | 0.5 | 9.1 | 0.5 | 29.2 | 1.8 |
| 4826 | C | 2 | 2.7 | 950 | 10 | 195 | 23 | 30 | 4 | 150 | 18 | 5.1 | 0.6 | 1.1 | 0.1 | 4.6 | 0.6 |
| 4827 | S | 2 | 3.2 | 1250 | 18 | 175 | 38 | 162 | 35 | 375 | 81 | 2.8 | 0.6 | 3.3 | 0.7 | 12.0 | 2.6 |
| 4828 | S | 2 | 2.7 | 70 | 12 | 290 | 42 | 90 | 13 | 310 | 45 | 11.1 | 1.6 | 1.7 | 0.2 | 12.0 | 1.7 |
| 4829 | S | 2 | 3.1 | 925 | 15 | 170 | 31 | 113 | 20 | 270 | 49 | 9.9 | 1.8 | 2.8 | 0.5 | 8.6 | 1.5 |

## BLACKLICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/1 | Acidity lb/day | Hardness mg/1 | Hardness lb/day | Sulfate mg/1 | Sulfate lb/day | Total Iron mg/1 | Total Iron lb/day | Manganese mg/1 | Manganese lb/day | Aluminum mg/1 | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4830 | D | 2 | 2.7 | 1800 | 6 | 430 | 31 | 144 | 10 | 580 | 42 | 62.5 | 4.5 | 4.3 | 0.3 | 14.8 | 1.1 |
| 4831 | S | 2 | 3.8 | 340 | 20 | 34 | 8 | 69 | 17 | 70 | 17 | 0.3 | 0.1 | 1.3 | 0.3 | 1.2 | 0.3 |
| 4832 | S | 2 | 3.9 | 450 | 25 | 60 | 18 | 114 | 34 | 150 | 45 | 0.2 | 0.1 | 2.2 | 0.7 | 3.3 | 1.0 |
| 4833 | S | 2 | 3.2 | 850 | 26 | 152 | 47 | 121 | 38 | 290 | 90 | 5.2 | 1.6 | 3.6 | 1.1 | 6.0 | 1.9 |
| 4834 | S | 2 | 5.5 | 590 | 15 | 34 | 6 | 192 | 35 | 200 | 36 | 0.1 | 0.0 | 0.8 | 0.1 | 3.3 | 0.6 |
| 4835 | D | 15 | 2.7 | 1500 | 33 | 227 | 90 | 73 | 29 | 200 | 79 | 10.8 | 4.3 | 0.7 | 0.3 | 7.9 | 3.1 |
| 4836 | D | 2 | 2.8 | 2400 | 85 | 530 | 541 | 342 | 349 | 880 | 898 | 66.3 | 67.6 | 1.9 | 1.9 | 21.5 | 21.9 |
| 4852 | Sh | 12 | 7.3 | 700 | 2 | 165 | 4 | 83 | 2 | 290 | 7 | 71.9 | 1.7 | 4.2 | 0.1 | 1.1 | 0.0 |
| 4853 | C | 12 | 3.7 | 3250 | 15 | 1460 | 263 | 62 | 11 | 1525 | 275 | 228.9 | 4.2 | 3.6 | 0.6 | 47.6 | 8.6 |
| 4854 | C | 12 | 3.7 | 3500 | 10 | 1235 | 148 | 56 | 7 | 1120 | 134 | 208.8 | 25.1 | 4.0 | 0.5 | 41.4 | 5.0 |
| 4855 | C | 12 | 3.7 | 1400 | 3 | 230 | 8 | 57 | 2 | 210 | 8 | 16.5 | 0.6 | 2.2 | 0.1 | 6.8 | 0.2 |
| 4856 | C | 12 | 3.7 | 2000 | 60 | 415 | 299 | 110 | 79 | 540 | 389 | 9.4 | 6.8 | 6.4 | 4.6 | 26.0 | 18.7 |
| 4857 | D | 1 | 4.2 | 3000 | 80 | 1185 | 1138 | 246 | 236 | 1505 | 1445 | 136.0 | 130.5 | 6.0 | 5.8 | 61.2 | 58.8 |
| 4858 | D | 1 | 3.8 | 7500 | 960 | 3260 | 37,555 | 615 | 7085 | 4500 | 51,840 | 340.1 | 3918.0 | 11.1 | 127.9 | 3.5 | 40.3 |
| 4859 | D | 9 | 3.4 | 4000 | 60 | 1585 | 1141 | 320 | 230 | 1600 | 1152 | 292.0 | 210.2 | 7.1 | 5.1 | 35.9 | 25.8 |
| 4860 | R | 9 | 3.1 | 5000 | 3 | 2210 | 80 | 232 | 8 | 2625 | 95 | 327.5 | 11.8 | 9.3 | 0.3 | 84.8 | 3.1 |
| 4861 | R | 1 | 3.0 | 5000 | 3 | 1940 | 70 | 58 | 2 | 2025 | 73 | 372.5 | 13.4 | 6.4 | 0.2 | 57.6 | 2.1 |
| 4862 | C | 12 | 3.8 | 1100 | 3 | 175 | 6 | 72 | 3 | 180 | 6 | 11.1 | 0.4 | 1.2 | 0.0 | 4.7 | 0.2 |
| 4863 | C | 2 | 5.0 | 650 | 200 | 215 | 516 | 37 | 89 | 150 | 360 | 15.4 | 37.0 | 1.0 | 2.4 | 4.7 | 11.3 |
| 4864 | C | 2 | 3.8 | 1200 | 25 | 261 | 78 | 194 | 58 | 525 | 158 | 14.3 | 4.3 | 6.2 | 1.9 | 10.5 | 3.2 |
| 4865 | S | 2 | 7.2 | 250 | 3 | -39 | -14 | 83 | 3 | 25 | 1 | 0.6 | 0.0 | 0.2 | 0.0 | 1.3 | 0.0 |
| 4866 | C | 2 | 3.8 | 3500 | 180 | 1170 | 2570 | 190 | 410 | 1395 | 3013 | 192.5 | 415.8 | 5.1 | 11.0 | 26.4 | 57.0 |
| 4867 | S | 2 | 6.2 | 250 | 40 | 64 | 32 | 48 | 23 | 25 | 12 | 1.0 | 0.5 | 0.2 | 0.1 | 1.3 | 0.6 |
| 4868 | D | 2 | 3.7 | 6000 | 120 | 1280 | 1843 | 127 | 183 | 1330 | 1915 | 302.5 | 435.6 | 3.7 | 5.3 | 50.1 | 72.1 |
| 4869 | C | 2 | 4.2 | 3750 | 90 | 1595 | 1722 | 400 | 432 | 2070 | 2236 | /35.0 | 37.8 | 6.8 | 7.3 | 74.0 | 79.9 |
| 4870 | C | 1 | 3.7 | 2100 | 8 | 545 | 52 | 97 | 9 | 650 | 62 | 87.0 | 8.4 | 2.1 | 0.2 | 25.4 | 2.4 |
| 4871 | S | 1 | 4.0 | 2850 | 8 | 640 | 61 | 156 | 15 | 770 | 74 | 59.5 | 5.7 | 2.8 | 0.3 | 22.4 | 2.2 |
| 4872 | S | 1 | 4.2 | 850 | 15 | 121 | 22 | 72 | 13 | 110 | 20 | 4.4 | 0.8 | 0.6 | 0.1 | 3.6 | 0.6 |

## BLACKLICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4873 | S | 1 | 3.9 | 1450 | 50 | 410 | 246 | 154 | 92 | 500 | 300 | 13.8 | 8.3 | 2.7 | 1.6 | 19.9 | 11.9 |
| 4874 | C | 1 | 4.0 | 1600 | 20 | 600 | 14 | 115 | 28 | 800 | 192 | 8.3 | 2.0 | 2.1 | 0.5 | 24.4 | 5.9 |
| 4875 | D | 2 | 7.3 | 320 | 18 | 149 | 32 | 62 | 13 | 40 | 9 | 3.6 | 0.8 | 0.2 | 0.0 | 1.3 | 0.3 |
| 4876 | C | 8 | 4.6 | 320 | 2 | 205 | 5 | 54 | 1 | 80 | 2 | 7.3 | 0.2 | 0.1 | 0.0 | [illegible] | 0.0 |
| 4877 | D | 2 | 3.5 | 850 | 1 | 230 | 3 | 63 | 1 | 260 | 3 | 28.5 | 0.3 | 1.3 | 0.0 | 5.4 | 0.1 |
| 4878 | C | 1 | 4.6 | 360 | 64 | 150 | 115 | 26 | 20 | 85 | 65 | 15.4 | 11.8 | 0.1 | 0.1 | 4.3 | 3.3 |
| 4879 | C | 1 | 3.6 | 2000 | 60 | 900 | 648 | 63 | 45 | 875 | 630 | 307.5 | 221.4 | 3.9 | 2.8 | 34.1 | 24.6 |
| 4880 | C | 2 | 7.1 | 120 | 10 | -1 | 0 | 45 | 5 | 60 | 7 | 13.6 | 1.6 | 0.1 | 0.0 | 3.7 | 0.4 |
| 4881 | S | 2 | 7.2 | 70 | 100 | 18 | 22 | 31 | 37 | 15 | 18 | 1.2 | 1.4 | 0.0 | 0.0 | 2.2 | 2.6 |
| 4882 | S | 2 | 6.5 | 500 | 25 | 52 | 16 | 217 | 65 | 265 | 80 | 5.4 | 1.6 | 4.7 | 1.4 | 3.7 | 1.1 |
| 4883 | S | 2 | 5.5 | 360 | 60 | 42 | 30 | 127 | 91 | 145 | 104 | 1.4 | 1.0 | 1.4 | 1.0 | 3.3 | 2.4 |
| 4884 | S | 2 | 6.5 | 300 | 75 | 56 | 50 | 97 | 87 | 110 | 99 | 0.4 | 0.4 | 1.9 | 1.7 | 3.1 | 2.8 |
| 4885 | S | 2 | 5.8 | 850 | 23 | 47 | 11 | 112 | 27 | 130 | 31 | 5.4 | 1.3 | 0.2 | 0.0 | 3.3 | 0.8 |
| 4886 | D | 1 | 7.5 | 200 | 12 | -26 | -4 | 81 | 12 | 60 | 9 | 0.8 | 0.1 | 0.1 | 0.1 | 3.3 | 0.5 |
| 4887 | D | 1 | 7.5 | 100 | 2 | 23 | 1 | 33 | 1 | 15 | 0 | 1.0 | 0.0 | 0.1 | 0.0 | 2.7 | 0.1 |
| 4888 | C | 1 | 6.5 | 480 | 20 | 31 | 7 | 194 | 47 | 225 | 54 | 0.5 | 0.1 | 2.2 | 0.5 | 3.7 | 0.9 |
| 4889 | D | 1 | 4.0 | 1800 | 40 | 750 | 360 | 206 | 99 | 940 | 451 | 275.0 | 132.0 | 3.1 | 1.5 | 31.0 | 14.9 |
| 4890 | D | 10 | 2.5 | 4000 | 405 | 2055 | 9987 | 390 | 1895 | 2250 | 10,935 | 788.0 | 3829.7 | 7.8 | 37.9 | 105.2 | 511.3 |
| 4891 | S | 10 | 2.2 | 4600 | 24 | 1705 | 491 | 69 | 20 | 2800 | 806 | 1525.0 | 439.2 | 5.3 | 1.5 | 97.5 | 28.1 |
| 4892 | S | 11 | 2.2 | 4000 | 2 | 2280 | 55 | 176 | 4 | 2050 | 49 | 739.0 | 17.7 | 13.2 | 0.3 | 114.6 | 2.8 |
| 4893 | S | 11 | 2.3 | 9800 | 5 | 20,000 | 1200 | 460 | 28 | 17,000 | 1020 | 7200.0 | 432.0 | 59.0 | 3.5 | 678.5 | 40.7 |
| 4894 | R | 11 | 2.2 | 5400 | 4 | 7800 | 374 | 340 | 16 | 9375 | 450 | 2025.0 | 97.2 | 81.0 | 3.9 | 372.5 | 17.9 |
| 4896 | S | 11 | 6.7 | 240 | 0 | -2 | 0 | 83 | 0 | 70 | 0 | 2.1 | 0.0 | 0.7 | 0.0 | 4.3 | 0.0 |
| 4897 | S | 1 | 2.2 | 32,000 | 3 | 61,250 | 2205 | 1900 | 68 | 62,000 | 2232 | 13,800.0 | 496.8 | 97.5 | 3.5 | 4630.0 | 166.7 |
| 4898 | C | 11 | 2.1 | 20,500 | 15 | 29,000 | 5220 | 1040 | 187 | 27,500 | 4950 | 11,800.0 | 2124.0 | 26.7 | 4.8 | 1782.5 | 320.9 |
| 4899 | R | 1 | 2.5 | 4000 | 6 | 3400 | 245 | 195 | 14 | 2850 | 205 | 1400.0 | 100.8 | 20.0 | 1.4 | 58.7 | 4.2 |
| 4900 | D | 4 | 2.7 | 1400 | 20 | 430 | 103 | 292 | 70 | 680 | 163 | 8.0 | 1.9 | 2.3 | 0.6 | 15.2 | 3.6 |
| 4901 | D | 2 | 3.3 | 1200 | 13 | 1550 | 242 | 338 | 53 | 675 | 105 | 5.0 | 0.8 | 7.6 | 1.2 | 19.4 | 3.0 |

## BLACKLICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4902 | D | 2 | 8.0 | 600 | 19 | -95 | -22 | 216 | 49 | 120 | 27 | 0.3 | 0.1 | 0.1 | 0.0 | 1.3 | 0.3 |
| 4903 | D | 2 | 2.9 | 1175 | 8 | 965 | 93 | 476 | 46 | 1500 | 144 | 72.5 | 7.0 | 19.0 | 1.8 | 53.8 | 5.2 |
| 4904 | D | 2 | 2.8 | 2800 | 7 | 1000 | 84 | 388 | 36 | 1505 | 126 | 85.0 | 7.1 | 9.1 | 0.8 | 54.8 | 4.6 |
| 4905 | D | 2 | 2.6 | 2250 | 12 | 905 | 130 | 203 | 29 | 1050 | 151 | 63.5 | 9.1 | 9.9 | 1.4 | 44.2 | 6.4 |
| 4906 | D | 2 | 3.1 | 2250 | 30 | 970 | 349 | 482 | 174 | 1440 | 518 | 37.5 | 13.5 | 33.0 | 11.9 | 50.1 | 18.0 |
| 4907 | D | 1 | 3.0 | 3250 | 2 | 1360 | 33 | 790 | 19 | 2000 | 48 | 90.0 | 2.2 | 6.6 | 0.2 | 85.1 | 2.0 |
| 4908 | D | 1 | 2.9 | 3000 | 1 | 975 | 12 | 640 | 8 | 1645 | 20 | 65.0 | 0.8 | 6.6 | 0.1 | 48.5 | 0.6 |
| 4909 | C | 2 | 3.6 | 1300 | 10 | 311 | 37 | 365 | 44 | 735 | 88 | 1.6 | 0.2 | 10.1 | 1.2 | 38.9 | 4.7 |
| 4910 | C | 2 | 2.7 | 2400 | 65 | 1855 | 1447 | 222 | 173 | 1080 | 842 | 67.5 | 52.6 | 20.0 | 15.6 | 51.1 | 39.9 |
| 4911 | D | 2 | 4.8 | 435 | 20 | 34 | 8 | 77 | 18 | 70 | 17 | 0.3 | 0.1 | 0.2 | 0.0 | 1.3 | 0.3 |
| 4912 | D | 2 | 4.8 | 250 | 15 | 15 | 3 | 68 | 12 | 50 | 9 | 1.0 | 0.2 | 0.3 | 0.1 | 1.3 | 0.2 |
| 4913 | D | 2 | 2.8 | 1750 | 22 | 479 | 126 | 290 | 77 | 900 | 238 | 40.0 | 10.6 | 9.4 | 2.5 | 21.6 | 5.7 |
| 4914 | D | 2 | 4.5 | 275 | 5 | 38 | 2 | 53 | 3 | 30 | 2 | 0.3 | 0.0 | 0.1 | 0.0 | 1.3 | 0.1 |
| 4915 | S | 4 | 2.8 | 310 | 15 | 67 | 12 | 46 | 8 | 60 | 11 | 0.7 | 0.1 | 0.3 | 0.1 | 1.3 | 0.2 |
| 4916 | S | 4 | 7.0 | 1100 | 5 | 55 | 3 | 271 | 16 | 150 | 9 | 0.2 | 0.0 | 4.1 | 0.2 | 1.5 | 0.1 |
| 4917 | S | 4 | 7.0 | 1000 | 120 | 47 | 68 | 213 | 307 | 90 | 130 | 0.2 | 0.3 | 0.8 | 1.2 | 2.0 | 2.9 |
| 4918 | S | 4 | 4.9 | 1300 | 60 | 38 | 27 | 448 | 323 | 330 | 238 | 0.2 | 0.1 | 2.9 | 2.1 | 3.9 | 2.8 |
| 4919 | S | 4 | 7.3 | 1100 | 12 | 30 | 4 | 272 | 39 | 60 | 9 | 0.4 | 0.1 | 0.1 | 0.0 | 1.3 | 0.2 |
| 4920 | C | 5 | 4.4 | 220 | 60 | 28 | 20 | 76 | 55 | 65 | 47 | 0.6 | 0.4 | 0.7 | 0.5 | 1.5 | 1.1 |
| 4921 | C | 5 | 7.4 | 150 | 5 | 8 | 0 | 67 | 4 | 45 | 3 | 0.3 | 0.0 | 0.1 | 0.0 | 0.8 | 0.0 |
| 4922 | D | 5 | 3.0 | 1000 | 255 | 235 | 719 | 131 | 401 | 350 | 1071 | 29.5 | 90.3 | 1.3 | 4.0 | 14.4 | 44.1 |
| 4923 | S | 5 | 7.4 | 60 | 12 | 19 | 3 | 21 | 3 | 20 | 3 | 0.5 | 0.1 | 0.1 | 0.0 | 0.8 | 0.1 |
| 4924 | S | 5 | 7.1 | 80 | 8 | -7 | -1 | 48 | 5 | 20 | 2 | 0.8 | 0.1 | 0.2 | 0.0 | 1.5 | 0.1 |
| 4925 | S | 5 | 4.4 | 340 | 6 | 95 | 7 | 106 | 8 | 165 | 12 | 0.4 | 0.0 | 1.9 | 0.1 | 4.7 | 0.3 |
| 5013 | D | 3 | 4.2 | 800 | 35 | 69 | 29 | 376 | 158 | 475 | 200 | 0.2 | 0.1 | 4.2 | 1.8 | 3.2 | 1.3 |
| 5014 | D | 14 | 2.5 | 1400 | 3 | 400 | 14 | 142 | 5 | 580 | 21 | 91.3 | 2.9 | 3.0 | 0.1 | 21.7 | 0.8 |
| 5015 | D | 6 | 2.9 | 2200 | 17 | 950 | 194 | 476 | 97 | 1375 | 281 | 56.2 | 11.1 | 34.5 | 7.0 | 44.4 | 9.1 |

## BLACKLICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5016 | S | 6 | 3.5 | 920 | 60 | 134 | 96 | 300 | 216 | 440 | 317 | 0.3 | 0.2 | 11.9 | 8.6 | 9.1 | 6.6 |
| 5017 | D | 2 | 2.5 | 1700 | 2 | 425 | 10 | 172 | 4 | 540 | 13 | 16.3 | 0.4 | 3.4 | 0.1 | 30.5 | 0.7 |
| 5018 | D | 2 | 2.2 | 1400 | 250 | 390 | 1170 | 94 | 282 | 420 | 1260 | 29.4 | 88.2 | 2.4 | 7.2 | 17.7 | 53.1 |
| 5019 | D | 2 | 2.5 | 1100 | 6 | 245 | 18 | 97 | 7 | 300 | 22 | 11.9 | 0.9 | 3.1 | 0.2 | 9.6 | 0.7 |
| 5020 | D | 2 | 2.4 | 1500 | 8 | 410 | 39 | 172 | 17 | 560 | 54 | 34.5 | 3.3 | 7.6 | 0.7 | 13.0 | 1.2 |
| 5021 | D | 2 | 2.5 | 1300 | 12 | 300 | 43 | 135 | 19 | 450 | 65 | 3.4 | 0.5 | 3.8 | 0.5 | 22.7 | 3.2 |
| 5022 | D | 2 | 2.4 | 1100 | 15 | 250 | 45 | 178 | 32 | 435 | 78 | 5.2 | 0.9 | 4.4 | 0.8 | 18.5 | 3.3 |
| 5023 | D | 1 | 2.2 | 950 | 2 | 170 | 4 | 60 | 1 | 210 | 5 | 12.1 | 0.3 | 1.2 | 0.0 | 5.5 | 0.1 |
| 5024 | D | 1 | 3.0 | 120 | 15 | 56 | 10 | 27 | 5 | 15 | 3 | 0.3 | 0.1 | 0.2 | 0.0 | 1.1 | 0.2 |
| 5025 | D | 1 | 4.4 | 95 | 5 | 22 | 1 | 65 | 4 | 15 | 1 | 0.1 | 0.0 | 0.1 | 0.0 | 0.8 | 0.0 |
| 5026 | D | 2 | 2.3 | 1600 | 540 | 535 | 3467 | 110 | 713 | 1000 | 6480 | 54.1 | 350.6 | 2.1 | 13.6 | 29.2 | 189.2 |
| 5027 | C | 14 | 2.6 | 1400 | 20 | 310 | 74 | 67 | 16 | 340 | 82 | 7.1 | 1.7 | 3.0 | 0.7 | 22.6 | 5.4 |
| 5028 | D | 2 | 2.3 | 1450 | 25 | 365 | 110 | 93 | 28 | 440 | 132 | 16.9 | 5.1 | 1.4 | 0.4 | 20.5 | 6.2 |
| 5029 | D | 2 | 2.5 | 240 | 8 | 60 | 6 | 41 | 4 | 60 | 6 | 0.8 | 0.1 | 0.6 | 0.1 | 2.7 | 0.3 |
| 5030 | S | 2 | 3.9 | 200 | 10 | 50 | 6 | 51 | 6 | 50 | 6 | 0.3 | 0.0 | 1.1 | 0.1 | 1.3 | 0.2 |
| 5031 | S | 14 | 2.5 | 1300 | 5 | 330 | 20 | 41 | 2 | 345 | 21 | 9.3 | 0.6 | 3.0 | 0.2 | 23.3 | 1.4 |
| 5032 | S | 2 | 2.7 | 800 | 11 | 225 | 30 | 93 | 12 | 340 | 45 | 15.7 | 2.1 | 4.6 | 0.6 | 8.8 | 1.2 |
| 5033 | S | 2 | 2.6 | 1300 | 15 | 465 | 84 | 57 | 10 | 465 | 84 | 17.6 | 3.2 | 3.3 | 0.6 | 21.0 | 3.8 |
| 5034 | C | 2 | 2.7 | 500 | 33 | 179 | 71 | 23 | 9 | 85 | 34 | 6.9 | 2.7 | 0.6 | 0.2 | 2.7 | 1.1 |
| 5035 | D | 14 | 3.0 | 1000 | 5 | 200 | 12 | 50 | 3 | 210 | 13 | 13.1 | 0.8 | 0.9 | 0.1 | 8.3 | 0.5 |
| 5036 | C | 2 | 2.8 | 260 | 30 | 240 | 86 | 19 | 7 | 30 | 11 | 0.5 | 0.2 | 0.4 | 0.1 | 2.1 | 0.8 |
| 5037 | R | 14 | 2.7 | 8000 | 480 | 6150 | 35,424 | 1400 | 8064 | 6000 | 34,560 | 400.0 | 2304.0 | 10.0 | 57.6 | 584.0 | 3363.8 |
| 5038 | S | 2 | 3.6 | 600 | 20 | 117 | 42 | 175 | 42 | 210 | 50 | 0.3 | 0.1 | 3.2 | 0.8 | 4.0 | 1.0 |
| 5039 | R | 14 | 2.7 | 8000 | 10 | 4075 | 489 | 1800 | 216 | 3875 | 465 | 175.0 | 21.0 | 6.0 | 36.0 | 355.0 | 42.6 |
| 5040 | R | 14 | 2.8 | 8000 | 6 | 7300 | 526 | 200 | 14 | 4250 | 306 | 55.0 | 4.0 | 8.8 | 0.6 | 425.0 | 30.6 |
| 5041 | S | 2 | 3.4 | 810 | 15 | 211 | 38 | 212 | 38 | 340 | 61 | 6.9 | 1.2 | 5.5 | 1.0 | 5.7 | 1.0 |
| 5042 | S | 2 | 3.2 | 520 | 10 | 221 | 27 | 64 | 8 | 180 | 22 | 0.2 | 0.0 | 2.6 | 0.3 | 5.8 | 0.7 |
| 5043 | D | 14 | 4.6 | 650 | 90 | 80 | 86 | 68 | 73 | 110 | 119 | 0.6 | 0.6 | 0.2 | 0.2 | 2.0 | 2.2 |
| 5044 | S | 14 | 4.5 | 260 | 1 | 40 | 0 | 29 | 0 | 15 | 0 | 0.2 | 0.0 | 0.1 | 0.0 | 2.1 | 0.0 |

## BLACKLICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/ | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5045 | S | 2 | 6.5 | 300 | 80 | 123 | 118 | 78 | 75 | 65 | 62 | [illegible] | [illegible] | 0.1 | 0.1 | 1.2 | 1.2 |
| 5046 | S | 6 | 3.6 | 440 | [illegible] | 105 | 0 | 88 | 0 | 160 | 0 | 1.0 | 0.0 | [illegible] | 0.0 | 4.5 | 0.0 |
| 5047 | S | 6 | 3.8 | 600 | 0 | 119 | 0 | 186 | 0 | 300 | 0 | 1.1 | 0.0 | 4.1 | 0.0 | 6.4 | 0.0 |
| 5048 | R | 14 | 3.5 | 1300 | 20 | 285 | 68 | 130 | 31 | 300 | 72 | 25.3 | 6.1 | 5.0 | 1.2 | 27.6 | 6.6 |
| 5076 | R | 14 | 1.9 | 12,800 | 8 | 21,800 | 2093 | 2000 | 192 | 22,000 | 2112 | 353.0 | 33.9 | 71.5 | 2.1 | 2504.0 | 240.4 |
| 5077 | R | 14 | 2.5 | 9200 | 3 | 15,300 | 551 | 1080 | 39 | 13,250 | 477 | 29.9 | 1.1 | 27.0 | 1.0 | 1585.0 | 57.1 |
| 5078 | R | 14 | 4.1 | 200 | 60 | -34 | -24 | 49 | 35 | 70 | 50 | 2.5 | 1.8 | 0.5 | 0.4 | 4.4 | 3.2 |
| 5079 | D | 16 | 2.8 | 1300 | 60 | 315 | 227 | 200 | 144 | 510 | 367 | 23.1 | 16.6 | 1.9 | 1.4 | 13.7 | 9.9 |
| 5080 | R | 16 | 2.4 | 4500 | 9 | 2875 | 311 | 210 | 23 | 2650 | 286 | 169.1 | 18.2 | 6.3 | 0.7 | 147.7 | 16.0 |
| 5082 | S | 16 | 2.8 | 1000 | 59 | 225 | 159 | 125 | 89 | 320 | 227 | 6.3 | 4.5 | 2.0 | 1.4 | 13.7 | 9.7 |
| 3571 | R | 7 | 2.6 | 15,000 | 12 | 32,700 | 4709 | 550 | 79 | 26,250 | 3780 | 10,160.0 | 1526.4 | 35.0 | 5.0 | 875.0 | 126.0 |
| 4541 | A Sh | 6 | 3.1 | 1300 | 2 | 315 | 8 | 234 | 6 | 735 | [illegible] | 13.5 | 0.3 | 6.3 | 0.2 | 14.8 | 0.4 |
| 4542 | A D | 13 | 2.5 | 2500 | 210 | 725 | 1827 | 160 | 403 | 800 | 2016 | 61.5 | 155.0 | 2.1 | 5.3 | 38.0 | 95.8 |
| 4851 | A D | 12 | 3.8 | 1400 | 1 | 380 | 5 | 104 | 1 | 465 | 6 | 66.0 | 0.8 | 6.5 | 0.1 | 7.4 | 0.1 |
| 4895 | A D | 11 | 7.0 | 600 | 40 | 22 | 17 | 216 | 104 | 165 | 79 | 1.0 | 0.5 | 0.1 | 0.0 | 4.6 | 2.2 |
| 4981 | A Sh | 6 | 3.8 | 1850 | 1710 | 125 | 2565 | 585 | 12,004 | 1075 | 22,059 | 15.2 | 311.9 | 1.9 | 39.0 | 4.6 | 94.4 |
| 5009 | A D | 16 | 6.8 | 350 | 30 | -28 | -10 | 136 | 49 | 95 | 34 | 1.3 | 0.5 | 0.3 | 0.1 | 4.1 | 1.5 |
| 5010 | A Sh | 18 | 7.2 | 950 | 1000 | -70 | -846 | 73 | 876 | 340 | 4080 | 2.6 | 31.2 | 0.2 | 2.4 | 2.4 | 28.8 |
| 5011 | A Sh | 18 | 3.6 | 2500 | 1062 | 1205 | 15,357 | 465 | 5926 | 1350 | 17,204 | 245.0 | 3122.3 | 17.4 | 221.7 | 74.8 | 953.3 |
| 5012 | A Sh | 17 | 4.4 | 2800 | 3800 | 975 | 44,682 | [illegible] | 9211 | 1680 | 76,608 | 296.3 | 13,511.3 | 5.9 | 269.0 | 36.1 | 1646.2 |
| 5125 | A Sh | 19 | 2.9 | 2600 | 3222 | 510 | 19,719 | 565 | 21,845 | 2020 | 78,101 | 222.5 | 8602.7 | 5.0 | 193.3 | 53.7 | 2076.3 |
| 5152 | A D | 1 | 2.9 | 1700 | 450 | 345 | 1863 | 404 | 2182 | 780 | 4212 | 12.7 | 68.6 | 3.1 | 16.7 | 13.5 | 72.9 |
| 5187 | A Sh | 13 | 2.9 | 2400 | 2000 | 555 | 13,320 | 254 | 6096 | 1200 | 28,800 | 154.0 | 3696.0 | 4.2 | 100.8 | 19.9 | 477.6 |
| 5188 | A Sh | 13 | 8.2 | 2400 | 1200 | -54 | -778 | 930 | 13,392 | 1320 | 19,008 | 15.5 | 223.2 | 0.7 | 10.1 | 1.5 | 21.6 |
| 5189 | A Sh | 14 | 4.6 | 3000 | 2700 | 1130 | 36,720 | 352 | 11,405 | 1855 | 60,102 | 266.0 | 8618.4 | 4.2 | 136.1 | 46.6 | 1509.8 |
| 4724 | R | 20 | 3.7 | 7000 | 2 | 5860 | 141 | 208 | 5 | 6200 | 149 | 522.5 | 12.5 | 91.2 | 2.2 | 588.4 | 14.1 |

# APPENDIX F

## Two Lick Creek

**Codes For Tabular Data - Pages F-1 Through F-7**

**Type**

C - Combination Mines
D - Drift Mines
S - Strip Mines
Sh- Shaft Mines
R - Refuse Piles
O - Gas Wells
CO- Coal Outcrop
A - Active

**Receiving Stream**

1 - Two Lick Creek
2 - Unnamed tribs to Two Lick Creek
3 - Yellow Creek
4 - Unnamed tribs to Yellow Creek
5 - North Branch Two Lick Creek
6 - Unnamed tribs to North Branch Two Lick Creek
7 - Unnamed tribs to Little Yellow Creek
8 - Buck Run
9 - Unnamed tribs to Buck Run
10 - Ferrier Run
11 - Unnamed tribs to Ferrier Run
12 - Dixon Run
13 - Unnamed tribs to Dixon Run
14 - Leonard Run
15 - Unnamed tribs to Leonard Run
16 - Penn Run
17 - Unnamed tribs to Penn Run
18 - Ramsey Run
19 - Allen Run
20 - Tearing Run
21 - Unnamed tribs to Tearing Run

## TWO LICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1254 | R | 3 | 5.6 | 210 | 50 | 35 | 21 | 78 | 47 | 65 | 39 | 0.9 | 0.5 | 0.8 | 0.5 | 0.9 | 0.5 |
| 1255 | D | 4 | 5.4 | 650 | 18 | 150 | 32 | 166 | 36 | 340 | 73 | 19.8 | 4.2 | 0.8 | 0.2 | 10.0 | 2.2 |
| 1256 | C | 4 | 3.1 | 2400 | 5 | 400 | 24 | 172 | 10 | 360 | 22 | 21.9 | 1.3 | 5.2 | 0.3 | 27.5 | 1.7 |
| 1257 | D | 4 | 2.9 | 1900 | 2 | 570 | 14 | 70 | 2 | 575 | 14 | 90.8 | 2.2 | 1.1 | 0.0 | 22.8 | 0.5 |
| 1258 | O | 4 | 5.4 | 2000 | 2 | 550 | 13 | 925 | 22 | 1375 | 33 | 216.3 | 5.2 | 11.8 | 0.3 | 0.4 | 0.0 |
| 1259 | C | 4 | 2.5 | 2700 | 3 | 1375 | 50 | 241 | 9 | 1680 | 60 | 63.9 | 2.3 | 50.0 | 1.8 | 127.1 | 4.6 |
| 1260 | S | 4 | 6.4 | 1250 | 2 | -32 | -1 | 649 | 15 | 615 | 15 | 10.0 | 0.2 | 4.6 | 0.1 | 3.8 | 0.1 |
| 1261 | C | 4 | 3.6 | 2000 | 40 | 650 | 312 | 305 | 110 | 1150 | 414 | 93.5 | 33.7 | 19.0 | 6.8 | 42.9 | 15.4 |
| 1262 | C | 4 | 3.0 | 6000 | 12 | 6500 | 936 | 500 | 72 | 7750 | 1116 | 582.0 | 83.8 | 24.5 | 3.5 | 962.0 | 138.5 |
| 1263 | C | 4 | 2.9 | 4000 | 25 | 2700 | 810 | 296 | 89 | 3050 | 915 | 472.0 | 141.6 | 6.2 | 1.9 | 178.0 | 53.4 |
| 1264 | D | 4 | 3.4 | 1100 | 12 | 275 | 40 | 144 | 21 | 420 | 60 | 14.5 | 2.1 | 0.8 | 0.1 | 19.3 | 2.8 |
| 1265 | D | 4 | 3.2 | 2000 | 6 | 500 | 36 | 55 | 4 | 575 | 41 | 54.0 | 3.9 | 1.7 | 0.1 | 19.3 | 1.4 |
| 1256 | C | 4 | 2.9 | 1800 | 33 | 490 | 176 | 113 | 41 | 525 | 189 | 27.2 | 9.8 | 1.0 | 0.4 | 33.7 | 12.1 |
| 1267 | CO | 3 | 4.4 | 1000 | 90 | 43 | 45 | 45 | 49 | 510 | 551 | 2.6 | 2.8 | 1.7 | 1.8 | 22.8 | 24.6 |
| 1268 | S | 11 | 3.7 | 1100 | 3 | 230 | 8 | 310 | 11 | 270 | 10 | 0.3 | 0.0 | 0.5 | 0.0 | 1.8 | 0.1 |
| 1269 | S | 10 | 4.2 | 600 | 13 | 75 | 14 | 85 | 15 | 160 | 29 | 2.9 | 0.5 | 1.0 | 0.1 | 4.1 | 0.7 |
| 1270 | C | 9 | 3.2 | 950 | 30 | 220 | 79 | 137 | 71 | 590 | 212 | [illegible] | 9.7 | 3.3 | 1.2 | 23.3 | 8.4 |
| 1271 | D | 8 | 5.3 | 450 | 15 | 70 | 13 | 161 | 29 | 220 | 40 | 12.2 | 2.2 | 0.1 | 0.7 | 3.4 | 0.6 |
| 1272 | R | 8 | 3.1 | 650 | 2 | 170 | 4 | 70 | 2 | 240 | 6 | 20.2 | 0.5 | 1.4 | 0.0 | 9.3 | 0.2 |
| 1273 | D | 9 | 3.1 | 275 | 35 | 370 | 155 | 256 | 108 | 645 | 271 | 3.2 | 1.1 | 11.9 | 5.0 | 15.5 | 6.5 |
| 1274 | S | 9 | 3.3 | 750 | 4 | 100 | 5 | 258 | 12 | 360 | 17 | 2.4 | 0.1 | 5.6 | 0.3 | 4.3 | 0.2 |
| 1275 | C | 3 | 4.0 | 650 | 20 | 110 | 26 | 127 | 29 | 200 | 48 | 1.1 | 0.3 | 3.3 | 0.8 | 8.4 | 2.0 |
| 1276 | C | 8 | 3.4 | 1300 | 3 | 215 | 8 | 494 | 18 | 795 | 29 | 5.4 | 0.2 | 3.2 | 0.1 | 8.2 | 0.3 |
| 1277 | S | 8 | 4.7 | 570 | 2 | 146 | 4 | 158 | 4 | 280 | 7 | 0.4 | 0.0 | 5.4 | 0.1 | 16.0 | 0.4 |
| 1278 | D | 3 | 4.4 | 700 | 1 | 36 | 0 | 172 | 2 | 185 | 2 | 0.6 | 0.0 | 1.6 | 0.0 | 2.1 | 0.0 |

P-1-2

TWO LICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1279 | D | 3 | 4.7 | 483 | 1 | 54 | 1 | 248 | 3 | 290 | 3 | 0.3 | 0.0 | 1.7 | 0.0 | 5.4 | 0.1 |
| 1280 | D | 3 | 3.8 | 1500 | 30 | 262 | 94 | 486 | 175 | 720 | 259 | 13.8 | 5.0 | 3.7 | 1.3 | 29.4 | 10.2 |
| 1282 | D | 13 | 6.5 | 750 | 8 | 5 | 0 | 344 | 33 | 350 | 35 | 19.2 | 1.8 | 1.0 | 0.1 | 1.8 | 0.2 |
| 1283 | S | 13 | 5.5 | 920 | 50 | 37 | 22 | 470 | 282 | 530 | 318 | 0.3 | 0.2 | 1.9 | 1.1 | 2.0 | 1.2 |
| 1284 | S | 13 | 2.9 | 2000 | 30 | 560 | 202 | 406 | 146 | 825 | 297 | 78.4 | 28.2 | 11.4 | 4.1 | 19.5 | 7.0 |
| 1285 | S | 12 | 6.3 | 280 | 3 | 9 | 0 | 162 | 6 | 145 | 5 | 0.3 | 0.0 | 1.0 | 0.0 | 2.0 | 0.1 |
| 1286 | C | 13 | 6.6 | 975 | 3 | -26 | -1 | 480 | 17 | 480 | 17 | 1.8 | 0.1 | 0.4 | 0.0 | 0.6 | 0.0 |
| 1287 | D | 13 | 2.8 | 925 | 1 | 165 | 2 | 196 | 2 | 360 | 4 | 6.5 | 0.1 | 2.4 | 0.0 | 7.1 | 0.1 |
| 1288 | S | 13 | 6.5 | 590 | 1 | -48 | -1 | 294 | 4 | 275 | 3 | 0.2 | 0.0 | 0.1 | 0.0 | 0.7 | 0.0 |
| 1289 | S | 13 | 5.8 | 170 | 1 | -25 | 0 | 69 | 1 | 40 | 0 | 1.9 | 0.0 | 2.0 | 0.0 | 0.9 | 0.0 |
| 1290 | C | 13 | 7.1 | 475 | 30 | -30 | 11 | 269 | 94 | 220 | 79 | 0.3 | 0.1 | 0.1 | 0.0 | 0.7 | 0.3 |
| 1291 | C | 12 | 6.6 | 560 | 200 | 75 | 180 | 244 | 586 | 215 | 516 | 0.2 | 0.5 | 0.1 | 0.2 | 0.9 | 2.2 |
| 1292 | D | 12 | 4.1 | 530 | 12 | 80 | 12 | 174 | 25 | 260 | 37 | 10.0 | 1.4 | 0.7 | 0.1 | 4.5 | 0.6 |
| 1293 | D | 13 | 5.3 | 525 | 18 | 41 | 10 | 176 | 38 | 245 | 53 | 6.6 | 1.4 | 1.9 | 0.4 | 2.2 | 0.5 |
| 1294 | D | 13 | 5.1 | 835 | 45 | -6 | -3 | 366 | 198 | 420 | 227 | 1.1 | 0.6 | 7.3 | 1.2 | 3.6 | 1.9 |
| 1296 | D | 12 | 6.5 | 750 | 40 | -70 | -34 | 202 | 97 | 320 | 154 | 0.3 | 0.1 | 0.3 | 0.1 | 0.7 | 0.3 |
| 1297 | S | 13 | 4.4 | 650 | 10 | 54 | 6 | 306 | 37 | 375 | 45 | 0.2 | 0.0 | 1.8 | 0.2 | 2.9 | 0.3 |
| 2298 | S | 12 | 4.0 | 1400 | 3 | 565 | 20 | 368 | 13 | 1110 | 40 | 0.2 | 0.0 | 11.1 | 0.4 | 57.5 | 2.1 |
| 1299 | D | 12 | 2.7 | 3250 | 1 | 1455 | 17 | 206 | 2 | 1600 | 19 | 86.0 | 1.0 | 5.5 | 0.1 | 99.6 | 1.2 |
| 4121 | C | 10 | 4.1 | 460 | 3 | 47 | 2 | 88 | 3 | 110 | 4 | 0.3 | 0.0 | 1.6 | 0.1 | 2.5 | 0.1 |
| 4122 | D | 3 | 4.0 | 700 | 1 | 135 | 2 | 113 | 1 | 260 | 3 | 37.4 | 0.4 | 1.1 | 0.0 | 7.6 | 0.1 |
| 4123 | D | 14 | 6.2 | 1200 | 20 | 53 | 12 | 535 | 143 | 285 | 68 | 3.4 | 0.8 | 1.6 | 0.4 | 7.0 | 1.7 |
| 4124 | C | 14 | 6.0 | 520 | 20 | -16 | -4 | 205 | 49 | 250 | 63 | 0.3 | 0.1 | 0.1 | 0.0 | 1.6 | 0.4 |
| 4125 | D | 14 | 5.2 | 750 | 20 | 58 | 14 | 316 | 76 | 290 | 70 | 0.3 | 0.1 | 1.2 | 0.3 | 6.4 | 1.5 |

TWO LICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | O | 15 | 6.5 | 390 | 20 | -10 | -2 | 118 | 28 | 80 | 19 | 7.7 | 1.8 | 1.0 | 0.2 | 1.0 | 0.2 |
| 4127 | S | 15 | 7.1 | 160 | 0 | -12 | 0 | 27 | 0 | 285 | 0 | 0.0 | 0.0 | 0.2 | 0.0 | 1.1 | 0.0 |
| 4128 | S | 14 | 4.2 | 725 | 5 | 49 | 3 | 232 | 14 | 350 | 21 | 0.3 | 0.0 | 0.9 | 0.1 | 4.0 | 0.2 |
| 4129 | D | 14 | 4.0 | 1700 | 3 | 330 | 12 | 498 | 18 | 580 | 21 | 1.0 | 0.0 | 6.5 | 0.2 | 23.4 | 0.8 |
| 4154 | D | 8 | 3.2 | 550 | 257 | 140 | 432 | 232 | 715 | 330 | 1018 | 4.9 | 15.1 | 3.2 | 9.9 | 9.5 | 29.2 |
| 4155 | C | 8 | 2.8 | 2400 | 1 | 1100 | 13 | 520 | 6 | 1710 | 21 | 1245.0 | 14.9 | 7.3 | 0.1 | 82.7 | 1.0 |
| 4156 | C | 8 | 2.9 | 850 | 45 | 150 | 81 | 410 | 221 | 570 | 308 | 2.6 | 1.4 | 2.0 | 1.1 | 12.1 | 6.5 |
| 4157 | D | 8 | 3.6 | 650 | 10 | 100 | 12 | 276 | 33 | 330 | 40 | 1.1 | 0.1 | 1.6 | 0.2 | 12.1 | 1.5 |
| 4158 | D | 8 | 3.3 | 750 | 11 | 74 | 10 | 290 | 38 | 340 | 45 | 0.6 | 0.1 | 2.6 | 0.3 | 6.9 | 0.9 |
| 4159 | C | 8 | 2.5 | 2400 | [illegible] | 1115 | 615 | 440 | 243 | 1800 | 994 | 195.8 | 108.1 | 7.5 | 4.1 | 63.4 | 35.0 |
| 4160 | S | 2 | 2.8 | 1900 | 15 | 870 | 157 | 314 | 57 | 1350 | 243 | 78.4 | 14.1 | 13.3 | 2.4 | 58.5 | 10.5 |
| 4161 | S | 2 | 3.0 | 1000 | 5 | 384 | 23 | 280 | 17 | 795 | 48 | 5.9 | 0.4 | 9.2 | 0.6 | 26.3 | 1.6 |
| 4162 | S | 2 | 3.1 | 1400 | 4 | 455 | 22 | 160 | 8 | 960 | 45 | 5.7 | 0.3 | 4.5 | 0.2 | 30.3 | 1.5 |
| 4163 | D | 2 | 3.2 | 440 | 4 | 103 | 5 | 82 | 4 | 155 | 7 | 12.5 | 0.6 | 0.8 | 0.0 | 3.2 | 0.2 |
| 4164 | C | 2 | 6.3 | 2200 | 4 | 1160 | 56 | 1350 | 65 | 1560 | 75 | 103.1 | 4.9 | 10.3 | 0.5 | 1.6 | 0.1 |
| 4165 | D | 1 | 2.9 | 2500 | 310 | 880 | 3274 | 367 | 1365 | 1230 | 4576 | 136.1 | 506.3 | 3.5 | 13.0 | 53.6 | 199.4 |
| 4166 | D | 1 | 2.5 | 4600 | 50 | 4400 | 2664 | 400 | 240 | 5775 | 3465 | 573.5 | 344.1 | 7.4 | 4.4 | 197.8 | 118.7 |
| 4167 | S | 9 | 4.5 | 460 | 5 | 63 | 4 | 195 | 12 | 240 | 14 | 0.2 | 0.0 | 1.8 | 0.1 | 3.9 | 0.2 |
| 4168 | D | 6 | 2.8 | 1400 | 2 | 356 | 9 | 228 | 5 | 570 | 14 | 19.0 | 0.5 | 2.2 | 0.1 | 13.4 | 0.3 |
| 4169 | D | 5 | 3.3 | 500 | 2 | 113 | 3 | 69 | 2 | 175 | 4 | 2.7 | 0.1 | 1.1 | 0.1 | 4.8 | 0.1 |
| 4170 | D | 5 | 3.6 | 1050 | 5 | 167 | 10 | 320 | 19 | 490 | 29 | 1.7 | 0.1 | 1.8 | 0.1 | 8.6 | 0.5 |
| 4171 | D | 5 | 3.5 | 1150 | 135 | 216 | 350 | 380 | 616 | 615 | 996 | 6.8 | 11.0 | 1.9 | 3.1 | 10.3 | 16.7 |
| 4172 | D | 5 | 3.8 | 775 | 5 | 190 | 11 | 250 | 15 | 290 | 17 | 2.5 | 0.2 | 3.1 | 0.2 | 8.9 | 0.5 |
| 4173 | D | 5 | 3.3 | 925 | 20 | 150 | 36 | 268 | 64 | 440 | 106 | 2.2 | 0.5 | 1.5 | 0.4 | 8.3 | 2.0 |
| 4174 | D | 5 | 3.2 | 725 | 5 | 100 | 54 | 166 | 10 | 260 | 16 | 2.2 | 0.1 | 1.1 | 0.1 | 8.2 | 0.5 |
| 4175 | D | 5 | 3.4 | 1000 | 12 | 155 | 22 | 324 | 47 | 540 | 78 | 0.9 | 0.1 | 2.3 | 0.3 | 10.5 | 1.5 |

## TWO LICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Mangnaese mg/l | Mangnaese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4176 | D | 14 | 3.4 | 1500 | 2 | 230 | 6 | 490 | 12 | 800 | 19 | 2.6 | 0.1 | 5.2 | 0.1 | 21.4 | 0.5 |
| 4177 | D | 15 | 4.4 | 520 | 12 | 68 | 10 | 164 | 24 | 205 | 30 | 0.3 | 0.0 | 1.3 | 0.2 | 3.7 | 0.5 |
| 4178 | S | 7 | 6.8 | 280 | 0 | -41 | 0 | 101 | 0 | 65 | 0 | 0.4 | 0.0 | 0.2 | 0.0 | 1.3 | 0.0 |
| 4179 | D | 3 | 5.2 | 700 | 13 | 98 | 12 | 282 | 34 | 350 | 42 | 0.4 | 0.0 | 2.9 | 0.3 | 5.0 | 0.6 |
| 4180 | C | 3 | 5.3 | 330 | 15 | 90 | 16 | 104 | 19 | 115 | 21 | 0.8 | 0.1 | 0.6 | 0.1 | 3.0 | 0.5 |
| 4181 | D | 3 | 6.5 | 650 | 819 | -84 | -845 | 312 | 3066 | 230 | 2260 | 0.5 | 4.9 | 0.1 | 1.0 | 1.4 | 13.8 |
| 4182 | D | 4 | 7.1 | 170 | 3 | 30 | 1 | 55 | 2 | 40 | 1 | 1.7 | 0.1 | 0.4 | 0.0 | 2.6 | 0.1 |
| 4183 | S | 4 | 6.6 | 650 | 0 | -129 | 0 | 270 | 0 | 145 | 0 | 0.3 | 0.0 | 0.1 | 0.0 | 1.3 | 0.0 |
| 4184 | Sh | 13 | 3.0 | 1600 | 30 | 575 | 207 | 322 | 116 | 960 | 346 | 110.0 | 39.6 | 3.1 | 1.1 | 33.5 | 12.1 |
| 4185 | R | 6 | 3.3 | 850 | 10 | 190 | 23 | 164 | 20 | 370 | 44 | 4.2 | 0.5 | 3.6 | 0.4 | 10.6 | 1.3 |
| 4186 | D | 5 | 3.2 | 900 | 60 | 150 | 108 | 324 | 233 | 460 | 331 | 1.3 | 0.9 | 0.8 | 0.6 | 6.5 | 4.7 |
| 4187 | S | 6 | 3.4 | 825 | 30 | 150 | 54 | 294 | 106 | 410 | 148 | 0.3 | 0.1 | 1.9 | 0.7 | 8.5 | 3.1 |
| 4188 | S | 5 | 3.3 | 750 | 40 | 151 | 72 | 194 | 93 | 330 | 158 | 0.9 | 0.4 | 1.9 | 0.9 | 9.5 | 4.6 |
| 4189 | S | 5 | 3.4 | 850 | 4 | 196 | 9 | 162 | 8 | 380 | 18 | 2.8 | 0.1 | 1.2 | 0.1 | 13.5 | 0.6 |
| 4190 | R | 1 | 6.4 | 250 | 10 | 9 | 1 | 99 | 12 | 90 | 11 | 1.0 | 0.1 | 0.1 | 0.0 | 1.1 | 0.1 |
| 4191 | D | 6 | 5.3 | 270 | 59 | -5 | -4 | 118 | 84 | 80 | 57 | 2.5 | 1.8 | 0.1 | 0.1 | 0.8 | 0.6 |
| 4192 | C | 5 | 5.0 | 1175 | 4 | 50 | 2 | 775 | 37 | 795 | 38 | 4.0 | 0.2 | 13.7 | 0.7 | 1.3 | 0.1 |
| 4193 | C | 5 | 5.9 | 480 | 60 | -16 | -12 | 252 | 181 | 210 | 151 | 2.5 | 1.8 | 0.2 | 0.1 | 1.5 | 1.1 |
| 4194 | C | 5 | 3.0 | 380 | 4 | 100 | 5 | 91 | 4 | 125 | 6 | 10.7 | 0.5 | 1.0 | 0.0 | 4.1 | 0.2 |
| 4195 | S | 6 | 3.1 | 425 | 15 | 368 | 66 | 444 | 80 | 885 | 159 | 14.4 | 2.6 | 4.4 | 0.8 | 28.8 | 5.2 |
| 4196 | D | 6 | 2.9 | 1500 | 30 | 500 | 180 | 384 | 138 | 1060 | 382 | 40.8 | 14.7 | 3.6 | 1.3 | 41.3 | 14.9 |
| 4197 | D | 5 | 5.5 | 500 | 985 | -32 | -378 | 320 | 3782 | 325 | 3841 | 0.6 | 7.1 | 0.9 | 10.6 | 0.8 | 9.5 |
| 4198 | D | 6 | 2.5 | 1100 | 95 | 280 | 319 | 298 | 340 | 540 | 616 | 1.7 | 1.9 | 1.6 | 1.8 | 18.0 | 20.5 |
| 4199 | D | 5 | 4.0 | 550 | 12 | 100 | 14 | 166 | 24 | 260 | 37 | 3.5 | 0.5 | 0.9 | 0.1 | 6.9 | 1.0 |
| 4200 | D | 5 | 2.5 | 650 | 2 | 100 | 2 | 204 | 5 | 245 | 6 | 1.3 | 0.0 | 0.7 | 0.0 | 6.7 | 0.2 |

## TWO LICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4700 | C | 1 | 3.8 | 4100 | 1 | 215 | 3 | 515 | 6 | 800 | 10 | 39.4 | 0.5 | 3.0 | 0.0 | 7.8 | 0.1 |
| 4701 | C | 1 | 3.9 | 1600 | 1 | 970 | 12 | 1080 | 13 | 2675 | 32 | 143.8 | 1.7 | 6.2 | 0.1 | 23.9 | 0.3 |
| 4702 | S | 1 | 4.0 | 680 | 2 | 85 | 2 | 208 | 5 | 320 | 8 | 7.8 | 0.2 | 4.5 | 0.1 | 2.0 | 0.0 |
| 4703 | D | 1 | 3.7 | 3500 | 20 | 1015 | 244 | 780 | 187 | 1935 | 464 | 182.8 | 43.9 | 12.0 | 2.9 | 27.6 | 6.6 |
| 4704 | D | 1 | 3.7 | 2900 | 105 | 875 | 1103 | 710 | 895 | 1610 | 2029 | 165.1 | 208.0 | 5.5 | 6.9 | 22.6 | 28.5 |
| 4705 | C | 1 | 4.1 | 1400 | 60 | 110 | 79 | 505 | 364 | 600 | 432 | 7.7 | 5.5 | 3.2 | 2.3 | 1.8 | 1.3 |
| 4706 | S | 1 | 6.9 | 2250 | 30 | 14 | 13 | 1230 | 1181 | 1230 | 1181 | 0.5 | 0.5 | 17.7 | 17.0 | 3.3 | 3.2 |
| 4707 | D | 16 | 3.9 | 1700 | 1 | 455 | 5 | 59 | 1 | 520 | 6 | 66.8 | 0.8 | 2.1 | 0.0 | 11.0 | 0.1 |
| 4708 | D | 16 | 3.8 | 3100 | 1 | 1745 | 21 | 159 | 2 | 1720 | 21 | 329.0 | 3.9 | 8.7 | 0.1 | 73.9 | 0.9 |
| 4709 | S | 17 | 4.3 | 1120 | 15 | 100 | 18 | 284 | 51 | 420 | 76 | 3.2 | 0.6 | 7.8 | 1.4 | 2.4 | 0.4 |
| 4710 | R | 2 | 3.9 | 22,000 | 9 | 45,700 | 4936 | 395 | 43 | 55,000 | 5940 | 6450.0 | 696.6 | 289.7 | 31.3 | 4325.0 | 467.1 |
| 4711 | R | 2 | 3.6 | 8000 | 5 | 7600 | 456 | 126 | 8 | 8800 | 528 | 1060.0 | 63.6 | 58.0 | 3.5 | 1194.0 | 71.6 |
| 4712 | R | 2 | 4.7 | 2000 | 12 | 160 | 23 | 196 | 28 | 330 | 48 | 4.1 | 0.6 | 5.5 | 0.8 | 14.5 | 2.1 |
| 4713 | S | 2 | 3.6 | 3000 | 10 | 950 | 114 | 404 | 48 | 1400 | 168 | 135.4 | 16.2 | 33.6 | 4.0 | 48.5 | 5.8 |
| 4714 | S | 1 | 3.6 | 2400 | 3 | 330 | 12 | 805 | 29 | 840 | 30 | 2.1 | 0.1 | 34.5 | 1.2 | 7.3 | 0.3 |
| 4715 | D | 17 | 3.6 | 1500 | 1 | 275 | 3 | 25 | 0 | 260 | 3 | 9.7 | 0.1 | 1.9 | 0.0 | 14.5 | 0.2 |
| 4717 | S | 17 | 7.2 | 520 | 5 | -15 | -1 | 186 | 11 | 180 | 11 | 0.9 | 0.1 | 4.4 | 0.3 | 1.5 | 0.1 |
| 4718 | S | 17 | 5.6 | 540 | 0 | 32 | 0 | 180 | 0 | 205 | 0 | 0.5 | 0.0 | 3.2 | 0.0 | 1.6 | 0.0 |
| 4720 | C | 1 | 3.4 | 1600 | 3 | 204 | 7 | 435 | 16 | 720 | 26 | 22.0 | 0.8 | 5.6 | 0.2 | 4.2 | 0.2 |
| 4721 | S | 2 | 6.8 | 420 | 7 | 19 | 2 | 116 | 10 | 105 | 9 | 1.8 | 0.2 | 2.0 | 0.2 | 0.6 | 0.1 |
| 4722 | S | 2 | 7.2 | 450 | 5 | -24 | -1 | 206 | 12 | 170 | 10 | 0.1 | 0.0 | 0.7 | 0.0 | 0.7 | 0.0 |
| 4723 | S | 2 | 3.7 | 650 | 7 | 120 | 10 | 86 | 7 | 175 | 15 | 5.3 | 0.4 | 2.8 | 0.2 | 2.2 | 0.2 |
| 4725 | R | 2 | 5.0 | 900 | 100 | 23 | 28 | 286 | 343 | 260 | 312 | 1.2 | 1.4 | 1.1 | 1.3 | 1.0 | 1.2 |
| 4726 | R | 2 | 4.2 | 800 | 5 | 48 | 3 | 162 | 10 | 160 | 10 | 1.8 | 0.1 | 0.6 | 0.0 | 1.9 | 0.1 |
| 4727 | D | 1 | 3.9 | 2400 | 30 | 790 | 284 | 160 | 58 | 900 | 324 | 127.3 | 45.8 | 2.9 | 1.0 | 46.3 | 16.7 |
| 4728 | D | 1 | 3.7 | 3100 | 220 | 1040 | 2746 | 204 | 539 | 1200 | 3168 | 100.2 | 264.5 | 4.0 | 10.6 | 57.3 | 151.3 |
| 4729 | R | 1 | 3.7 | 2500 | 20 | 610 | 146 | 308 | 74 | 630 | 151 | 23.9 | 5.7 | 7.1 | 1.7 | 56.0 | 13.4 |

## TWO LICK CREEK

| Mine No. | Source Type* | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4730 | R | 1 | 4.2 | 1300 | 3 | 123 | 4 | 400 | 14 | 495 | 18 | 0.9 | 0.0 | 4.3 | 0.2 | 12.7 | 0.5 |
| 4731 | S | 2 | 3.5 | 2600 | 1 | 750 | 9 | 236 | 3 | 805 | 10 | 62.5 | 0.8 | 8.0 | 0.1 | 48.9 | 0.6 |
| 4732 | D | 2 | 3.7 | 1500 | 30 | 355 | 128 | 228 | 82 | 580 | 209 | 30.5 | 11.0 | 4.0 | 1.4 | 17.0 | 6.1 |
| 4733 | D | 2 | 4.0 | 1200 | 6 | 200 | 144 | 220 | 16 | 450 | 32 | 2.1 | 0.2 | 7.5 | 0.5 | 17.0 | 1.2 |
| 4734 | D | 2 | 3.8 | 2800 | 12 | 815 | 117 | 119 | 17 | 805 | 115 | 16.8 | 5.7 | 5.7 | 0.8 | 44.9 | 6.5 |
| 4735 | C | 21 | 3.5 | 1700 | 45 | 350 | 189 | 101 | 55 | 520 | 281 | 36.5 | 19.7 | 2.3 | 1.2 | 17.3 | 9.3 |
| 4736 | C | 21 | 4.2 | 190 | 2 | 30 | 1 | 20 | 0 | 25 | 1 | 0.2 | 0.0 | 0.2 | 0.0 | 1.3 | 0.0 |
| 4737 | S | 21 | 3.9 | 3500 | 15 | 1620 | 292 | 224 | 40 | 1800 | 324 | 156.7 | 28.2 | 6.1 | 1.1 | 95.6 | 17.2 |
| 4738 | S | 21 | 3.6 | 2200 | 60 | 540 | 389 | 200 | 144 | 805 | 580 | 66.5 | 47.9 | 3.5 | 2.5 | 22.0 | 15.8 |
| 4739 | S | 21 | 3.8 | 2200 | 30 | 485 | 175 | 220 | 79 | 660 | 238 | 32.5 | 11.7 | 4.3 | 1.5 | 21.6 | 7.8 |
| 4740 | S | 21 | 3.9 | 2200 | 30 | 540 | 194 | 208 | 75 | 630 | 227 | 35.7 | 12.9 | 3.9 | 1.4 | 21.6 | 7.8 |
| 4741 | S | 21 | 3.7 | 2800 | 60 | 770 | 554 | 256 | 184 | 910 | 655 | 74.3 | 53.5 | 4.6 | 3.3 | 39.1 | 28.2 |
| 4749 | D | 21 | 3.6 | 3000 | 5 | 785 | 47 | 170 | 10 | 840 | 50 | 97.8 | 5.9 | 3.3 | 0.2 | 32.3 | 1.9 |
| 4751 | S | 5 | 5.7 | 750 | 15 | -98 | -18 | 304 | 55 | 280 | 50 | 0.5 | 0.1 | 1.7 | 0.3 | 1.4 | 0.3 |
| 4752 | R | 5 | 2.3 | 2600 | 30 | 1100 | 396 | 284 | 102 | 1290 | 464 | 125.4 | 45.1 | 4.5 | 1.6 | 33.8 | 12.2 |
| 4753 | S | 2 | 2.8 | 550 | 45 | 70 | 38 | 130 | 70 | 185 | 100 | 1.0 | 0.5 | 4.2 | 2.3 | 4.0 | 2.2 |
| 4754 | S | 2 | 2.6 | 1200 | 15 | 281 | 51 | 358 | 64 | 660 | 119 | 1.7 | 0.3 | 16.0 | 2.9 | 20.8 | 3.7 |
| 4755 | S | 2 | 2.3 | 2000 | 11 | 400 | 53 | 374 | 49 | 750 | 99 | 18.7 | 2.5 | 7.0 | 0.9 | 23.2 | 3.1 |
| 4756 | S | 19 | 5.8 | 200 | 95 | 12 | 14 | 74 | 84 | 60 | 68 | 0.1 | 0.1 | 0.6 | 0.7 | 0.7 | 0.8 |
| 4757 | S | 19 | 2.6 | 520 | 12 | 72 | 10 | 156 | 22 | 230 | 33 | 0.3 | 0.0 | 5.4 | 0.8 | 2.9 | 0.4 |
| 4758 | CO | 18 | 5.6 | 170 | 8 | -23 | -2 | 67 | 6 | 40 | 4 | 0.6 | 0.1 | 1.9 | 0.2 | 0.6 | 0.1 |
| 4759 | D | 1 | 2.9 | 360 | 12 | 90 | 13 | 62 | 9 | 95 | 14 | 5.3 | 0.8 | 0.3 | 0.0 | 4.2 | 0.6 |
| 4760 | D | 1 | 2.9 | 2000 | 45 | 213 | 115 | 1215 | 656 | 1275 | 689 | 43.0 | 23.2 | 17.4 | 9.4 | 4.4 | 2.4 |
| 4761 | D | 21 | 2.7 | 1100 | 20 | 24 | 6 | 81 | 19 | 300 | 72 | 10.0 | 2.4 | 1.4 | 0.3 | 13.1 | 3.1 |
| 4762 | D | 21 | 4.9 | 220 | 3 | 22 | 1 | 113 | 4 | 120 | 4 | 1.3 | 0.0 | 0.8 | 0.0 | 1.4 | 0.1 |
| 4763 | R | 20 | 2.8 | 625 | 10 | 115 | 14 | 198 | 24 | 280 | 34 | 2.4 | 0.3 | 2.7 | 0.3 | 7.5 | 0.9 |

TWO LICK CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/1 | Acidity lb/day | Hardness mg/1 | Hardness lb/day | Sulfate mg/1 | Sulfate lb/day | Total Iron mg/1 | Total Iron lb/day | Manganese mg/1 | Manganese lb/day | Aluminum mg/1 | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4764 | D | 20 | 2.7 | 1500 | 25 | 250 | 75 | 344 | 103 | 660 | 198 | 36.7 | 11.0 | 5.7 | 1.7 | 2.7 | 0.8 |
| 4765 | D | 20 | 2.3 | 2000 | 8 | 680 | 65 | 226 | 22 | 875 | 84 | 15.9 | 1.5 | 8.8 | 0.8 | 25.5 | 2.4 |
| 4766 | D | 21 | 2.4 | 600 | 12 | 190 | 27 | 61 | 9 | 260 | 37 | 0.3 | 0.0 | 3.2 | 0.5 | 17.3 | 2.5 |
| 4767 | D | 21 | 2.1 | 1150 | 18 | 125 | 27 | 338 | 73 | 585 | 126 | 11.3 | 2.4 | 1.7 | 0.4 | 2.8 | 0.6 |
| 4768 | D | 21 | 2.1 | 950 | 2 | 260 | 6 | 107 | 3 | 360 | 9 | 32.8 | 0.8 | 1.4 | 0.0 | 11.4 | 0.3 |
| 4769 | D | 20 | 2.1 | 3000 | 90 | 1660 | 1793 | 490 | 529 | 2485 | 2684 | 167.3 | 180.7 | 7.6 | 8.2 | 76.7 | 82.8 |
| 4770 | D | 20 | 2.3 | 4000 | 10 | 200 | 24 | 450 | 54 | 2500 | 300 | 253.0 | 30.4 | 8.4 | 1.0 | 98.6 | 11.8 |
| 4771 | D | 20 | 2.7 | 1500 | 380 | 390 | 1778 | 290 | 1322 | 780 | 3557 | 38.2 | 174.2 | 1.8 | 8.2 | 17.0 | 77.5 |
| 4775 | D | 12 | 6.7 | 390 | 3 | 29 | 1 | 174 | 6 | 170 | 6 | 0.4 | 0.0 | 1.2 | 0.0 | 1.8 | 0.1 |
| 4776 | D | 12 | 6.8 | 570 | 15 | -82 | -15 | 238 | 43 | 165 | 30 | 0.6 | 0.1 | 0.2 | 0.0 | 1.8 | 0.3 |
| 4777 | S | 12 | 6.7 | 700 | 8 | -126 | -12 | 226 | 22 | 180 | 17 | 0.5 | 0.0 | 0.1 | 0.0 | 1.5 | 0.1 |
| 4791 | Sh | 1 | 3.8 | 3600 | 320 | 2060 | 7910 | 750 | 2880 | 2970 | 11,405 | 84.5 | 324.5 | 11.6 | 44.5 | 100.3 | 385.2 |
| 5001 | R | 3 | 2.3 | 5500 | 3 | 4475 | 161 | 505 | 18 | 4875 | 176 | 398.0 | 14.3 | 25.0 | 0.9 | 148.0 | 5.3 |
| 5002 | R | 3 | 3.3 | 3800 | 1 | 3325 | 40 | 990 | 12 | 3150 | 38 | 11.0 | 0.1 | 15.0 | 0.2 | 296.0 | 3.6 |
| 5003 | R | 3 | 3.4 | 2500 | 2 | 1435 | 34 | 28 | 1 | 1380 | 33 | 0.8 | 0.0 | 10.3 | 0.2 | 122.3 | 2.9 |
| 5004 | R | 3 | 2.8 | 2500 | 20 | 1410 | 338 | 315 | 76 | 1590 | 382 | 52.1 | 12.5 | 9.1 | 2.2 | 105.6 | 25.3 |
| 5005 | R | 3 | 2.5 | 2000 | 0 | 510 | 0 | 530 | 0 | 870 | 0 | 69.0 | 0.0 | 6.8 | 0.0 | 7.9 | 0.0 |
| 5006 | R | 3 | 2.1 | 8000 | 3 | 15,250 | 549 | 860 | 31 | 17,750 | 639 | 1178.0 | 42.4 | 30.5 | 1.1 | 1605.0 | 57.8 |
| 5150 | AD | 1 | 3.1 | 1900 | 11 | 400 | 53 | 680 | 90 | 1125 | 149 | 54.8 | 7.2 | 2.6 | 0.3 | 4.4 | 0.6 |
| 1281 | AS | 13 | 7.1 | 420 | 1 | -52 | -1 | 162 | 2 | 135 | 2 | 3.0 | 0.0 | 15.0 | 0.2 | 1.8 | 0.0 |
| 1295 | AD | 13 | 7.0 | 410 | 30 | -60 | -22 | 187 | 66 | 130 | 47 | 0.4 | 0.1 | 0.3 | 0.1 | 0.9 | 0.3 |
| 4716 | AD | 16 | 8.4 | 1000 | 360 | -123 | -531 | 420 | 1814 | 380 | 1642 | 28.5 | 123.1 | 1.8 | 7.8 | 3.0 | 13.0 |
| 5148 | AD | 14 | 6.7 | 1200 | 60 | 53 | 38 | 660 | 475 | 765 | 551 | 1.4 | 1.0 | 3.1 | 2.2 | 0.8 | 0.6 |
| 5149 | AR | 14 | 2.8 | 3000 | 1 | 1460 | 18 | 525 | 6 | 345 | 4 | 76.3 | 0.9 | 62.5 | 0.8 | 113.2 | 1.4 |
| 5151 | AD | 1 | 2.8 | 2800 | 1 | 1125 | 14 | 935 | 11 | 2345 | 28 | 346.5 | 4.2 | 12.8 | 0.2 | 31.4 | 0.4 |
| 5153 | AD | 1 | 6.9 | 2100 | 100 | -50 | -60 | 790 | 948 | 1225 | 1470 | 2.0 | 2.4 | 2.0 | 2.4 | 0.0 | 0.0 |

# APPENDIX G

# LITTLE CONEMAUGH RIVER

Codes for Tabular Data - Pages G-1 Through G-4

**Type**

C - Combination Mines

D - Drift Mines

S - Strip Mines

Sh- Shaft Mines

R - Refuse Piles

O - Oil Well

CO- Coal Outcrop

A - Active

**Receiving Stream**

1 - Little Conemaugh River

2 - Unnamed tribs. to Little Conemaugh River

3 - North Branch

4 - South Fork

5 - Unnamed tribs to South Fork

6 - Bear Rock Run

7 - Unnamed tribs. to Bear Rock Run

8 - Christie Hollow

9 - Bens Creek

10 - Unnamed tribs. to Bens Creek

11 - Trout Run

12 - Unnamed tribs. to Trout Run

13 - Spring Run

14 - Unnamed tribs. to Spring Run

15 - Sulphur Creek

16 - Unnamed tribs to Sulphur Creek

17 - Saltlick Run

18 - Bear Run

19 - Clapboard Run

LITTLE CONEMAUGH RIVER

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity | | Hardness | | Sulfate | | Total Iron | | Manganese | | Aluminum | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day | mg/l | lb/day |
| 5007 | Sh | 1 | 3.4 | 1900 | 24 | 600 | 173 | 455 | 131 | 575 | 194 | 79.5 | 22.9 | 6.2 | 1.8 | 25.6 | 7.4 |
| 5008 | Sh | 1 | 5.6 | 2700 | 278 | 480 | 1601 | 885 | 2952 | 1610 | 5371 | 118.1 | 393.9 | 5.9 | 19.7 | 8.5 | 28.4 |
| 5049 | S | 10 | 4.6 | 75 | 0 | 36 | 0 | 25 | 0 | 15 | 0 | 0.6 | 0.0 | 0.5 | 0.0 | 1.8 | 0.0 |
| 5050 | D | 8 | 4.5 | 50 | 5 | 45 | 3 | 18 | 1 | 15 | 1 | 0.5 | 0.0 | 0.3 | 0.0 | 0.5 | 0.0 |
| 5051 | D | 6 | 5.0 | 90 | 4 | 21 | 1 | 20 | 1 | 20 | 1 | 0.4 | 0.0 | 0.1 | 0.0 | 1.4 | 0.1 |
| 5052 | D | 6 | 4.8 | 130 | 2 | 84 | 2 | 25 | 1 | 25 | 1 | 1.6 | 0.0 | 0.2 | 0.0 | 1.6 | 0.0 |
| 5053 | R | 7 | 3.0 | 1000 | 3 | 230 | 8 | 157 | 6 | 375 | 14 | 5.1 | 0.2 | 2.2 | 0.1 | 29.6 | 1.1 |
| 5054 | D | 7 | 6.0 | 220 | 3 | -36 | -1 | 72 | 3 | 35 | 1 | 0.1 | 0.0 | 0.0 | 0.0 | 1.9 | 0.1 |
| 5055 | D | 6 | 2.5 | 1500 | 13 | 345 | 54 | 152 | 24 | 700 | 109 | 11.5 | 1.8 | 4.0 | 0.6 | 21.4 | 3.3 |
| 5056 | R | 6 | 3.8 | 600 | 13 | 98 | 15 | 125 | 20 | 35 | 5 | 0.4 | 0.1 | 1.2 | 0.2 | 4.1 | 0.6 |
| 5057 | D | 8 | 3.0 | 220 | 14 | 47 | 8 | 25 | 4 | 40 | 7 | 24.4 | 4.1 | 0.9 | 0.2 | 0.3 | 0.1 |
| 5058 | S | 6 | 3.8 | 340 | 180 | 69 | 149 | 20 | 43 | 40 | 86 | 8.4 | 18.1 | 1.4 | 3.0 | 6.2 | 13.4 |
| 5059 | D | 6 | 4.4 | 160 | 10 | 48 | 6 | 17 | 2 | 10 | 1 | 0.2 | 0.0 | 0.0 | 0.0 | 7.0 | 8.4 |
| 5060 | D | 2 | 2.4 | 2700 | 16 | 415 | 80 | 174 | 33 | 495 | 95 | 40.5 | 7.8 | 2.5 | 0.5 | 18.4 | 3.5 |
| 5061 | D | 2 | 2.7 | 2600 | 65 | 480 | 374 | 120 | 34 | 620 | 484 | 33.5 | 26.1 | 2.3 | 1.8 | 20.3 | 15.8 |
| 5062 | D | 2 | 2.9 | 2000 | 20 | 250 | 60 | 82 | 20 | 275 | 61 | 10.0 | 2.4 | 1.0 | 0.2 | 10.4 | 2.5 |
| 5063 | D | 2 | 3.2 | 2000 | 6 | 250 | 18 | 280 | 20 | 575 | 41 | 20.4 | 1.5 | 4.2 | 0.3 | 12.3 | 0.9 |
| 5064 | S | 12 | 2.5 | 6000 | 8 | 6100 | 586 | 680 | 60 | 7425 | 713 | 23.4 | 2.2 | 472.5 | 40.4 | 364.0 | 34.9 |
| 5065 | S | 12 | 2.6 | 3000 | 3 | 1470 | 53 | 820 | 30 | 2485 | 89 | 37.0 | 1.3 | 182.5 | 6.6 | 84.2 | 3.0 |
| 5066 | S | 12 | 2.6 | 4200 | 5 | 2110 | 127 | 1370 | 82 | 3700 | 222 | 78.0 | 4.7 | 197.5 | 11.9 | 12.3 | 0.7 |
| 5067 | S | 14 | 2.7 | 2000 | 28 | 860 | 289 | 545 | 183 | 1525 | 512 | 114.5 | 38.5 | 52.5 | 17.6 | 35.3 | 11.9 |
| 5068 | D | 14 | 6.1 | 675 | 4 | 6 | 0 | 322 | 15 | 380 | 15 | 1.8 | 0.1 | 7.0 | 0.3 | 0.9 | 0.0 |
| 5069 | R | 13 | 3.5 | 1900 | 2 | 770 | 18 | 510 | 12 | 1425 | 34 | 0.8 | 0.0 | 13.3 | 0.3 | 59.5 | 1.4 |
| 5070 | R | 2 | 2.5 | 6000 | 5 | 5760 | 345 | 1125 | 68 | 6525 | 391 | 100.0 | 6.0 | 103.0 | 6.2 | 553.0 | 33.2 |
| 5083 | Sh | 5 | 4.5 | 3500 | 3,272 | 1215 | 47,706 | 1470 | 57,718 | 2565 | 100,712 | 615.0 | 24,147 | 12.8 | 502.6 | 20.6 | 808.6 |

6-1-62

LITTLE CONEMAUGH RIVER

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5084 | S | 18 | 3.1 | 2400 | 9 | 1015 | 110 | 470 | 51 | 1620 | 175 | 308.0 | 33.3 | 9.8 | 1.1 | 42.2 | 4.6 |
| 5085 | S | 18 | 3.4 | 1200 | 81 | 225 | 219 | 382 | 371 | 690 | 671 | 23.0 | 22.4 | 8.5 | 8.3 | 7.0 | 6.8 |
| 5087 | D | 2 | 5.6 | 1500 | 18 | -33 | -7 | 795 | 171 | 840 | 181 | 38.5 | 8.3 | 13.3 | 2.9 | 0.0 | 0.0 |
| 5088 | R | 2 | 2.6 | 25,000 | 9 | 28,800 | 3110 | 1300 | 140 | 32,500 | 3510 | 13,000.0 | 1404.0 | 435.0 | 47.0 | 8.5 | 0.9 |
| 5089 | S | 2 | 3.3 | 2500 | 12 | 705 | 102 | 750 | 108 | 1320 | 190 | 7.5 | 1.0 | 11.9 | 1.7 | 40.7 | 5.9 |
| 5090 | S | 2 | 3.4 | 2400 | 6 | 800 | 58 | 585 | 42 | 1350 | 97 | 4.9 | 0.4 | 16.4 | 1.2 | 49.4 | 3.6 |
| 5091 | S | 2 | 4.5 | 760 | 1 | 139 | 1 | 284 | 3 | 420 | 5 | 1.3 | 0.0 | 9.3 | 0.1 | 6.8 | 0.1 |
| 5092 | Sh | 17 | 3.7 | 1500 | 358 | 271 | 1197 | 374 | 1652 | 780 | 3444 | 1.2 | 5.3 | 3.0 | 13.2 | 18.2 | 80.4 |
| 5093 | Sh | 17 | 3.8 | 750 | 150 | 75 | 135 | 296 | 533 | 395 | 711 | 1.2 | 2.2 | 0.7 | 12.6 | 2.5 | 4.5 |
| 5094 | Sh | 17 | 3.7 | 2400 | 153 | 270 | 496 | 530 | 973 | 1110 | 2038 | 402.5 | 739.0 | 2.5 | 4.6 | 0.0 | 0.0 |
| 5095 | D | 1 | 2.9 | 2000 | 60 | 565 | 407 | 380 | 274 | 900 | 648 | 18.3 | 13.2 | 4.3 | 3.1 | 34.0 | 24.5 |
| 5096 | C | 1 | 2.9 | 2600 | 72 | 1100 | 950 | 560 | 484 | 1710 | 1477 | 158.0 | 136.5 | 6.1 | 5.3 | 62.7 | 54.2 |
| 5097 | C | 1 | 3.0 | 1750 | 65 | 445 | 347 | 396 | 309 | 800 | 624 | 12.9 | 10.1 | 3.0 | 2.3 | 23.9 | 18.6 |
| 5098 | S | 1 | 3.2 | 2200 | 42 | 735 | 370 | 480 | 249 | 1375 | 693 | 104.0 | 52.4 | 6.6 | 3.3 | 30.1 | 15.1 |
| 5099 | C | 1 | 2.8 | 2200 | 90 | 495 | 535 | 412 | 445 | 900 | 972 | 19.0 | 20.5 | 2.5 | 2.7 | 37.0 | 40.0 |
| 5100 | D | 4 | 2.9 | 2000 | 1408 | 730 | 12,334 | 728 | 12,300 | 1150 | 19,430 | 197.5 | 3,337.0 | 5.0 | 84.5 | 50.0 | 844.8 |
| 5101 | C | 1 | 7.0 | 1000 | 100 | -9 | -11 | 745 | 894 | 820 | 984 | 0.7 | 0.8 | 0.5 | 0.6 | 1.4 | 1.7 |
| 5102 | D | 1 | 4.2 | 1175 | 65 | 200 | 156 | 720 | 562 | 705 | 550 | [illegible] | 3.0 | 1.7 | 1.3 | 14.6 | 11.4 |
| 5103 | D | 1 | 4.5 | 1400 | 48 | 295 | 170 | 665 | 383 | 1110 | 639 | 0.2 | 0.1 | 1.7 | 1.0 | 17.3 | 10.0 |
| 5105 | D | 2 | 4.7 | 390 | 36 | 14 | 6 | 164 | 71 | 170 | 73 | 0.1 | 0.0 | 0.5 | 0.2 | 2.1 | 0.9 |
| 5106 | D | 2 | 3.1 | 1900 | 15 | 290 | 52 | 780 | 140 | 1050 | 189 | 5.2 | 0.9 | 2.7 | 0.5 | 11.6 | 2.1 |
| 5107 | D | 2 | 6.4 | 900 | 90 | 48 | 52 | 352 | 380 | 490 | 529 | 3.4 | 0.4 | 0.9 | 1.0 | 2.9 | 3.1 |
| 5108 | D | 1 | 2.9 | 1950 | 8 | 445 | 43 | 590 | 61 | 1225 | 118 | 13.4 | 1.3 | 4.9 | 0.5 | 6.0 | 0.6 |
| 5109 | D | 1 | 2.7 | 2600 | 25 | 1125 | 338 | 590 | 177 | 1850 | 988 | 27.0 | 8.1 | 31.3 | 9.4 | 78.7 | 23.6 |
| 5110 | D | 1 | 6.9 | 975 | 50 | -117 | -70 | 500 | 300 | 450 | 270 | 0.1 | 0.1 | 0.1 | 0.1 | 2.6 | 1.6 |
| 5111 | R | 1 | 4.3 | 325 | 18 | 32 | 7 | 109 | 24 | 135 | 29 | 0.2 | 0.0 | 0.9 | 0.2 | 2.1 | 0.5 |
| 5112 | D | 1 | 3.1 | 1500 | 882 | 250 | 2645 | 525 | 5557 | 800 | 8457 | 8.6 | 93.1 | 1.5 | 15.9 | 9.9 | 104.8 |

## LITTLE CONEMAUGH RIVER

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5113 | D | 3 | 7.0 | 1650 | 45 | -275 | -149 | 147 | 79 | 640 | 346 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 |
| 5114 | Sh | 1 | 4.3 | 2500 | 1400 | 705 | 11,844 | 1075 | 18,060 | 1620 | 27,216 | 360.0 | 6048.0 | 6.1 | 102.5 | 15.4 | 258.7 |
| 5115 | Sh | 1 | 3.2 | 1400 | 563 | 560 | 3783 | 410 | 2770 | 1125 | 7601 | 100.1 | 676.3 | 6.4 | 43.2 | 28.3 | 191.2 |
| 5116 | D | 1 | 3.2 | 590 | 18 | 112 | 24 | 131 | 28 | 200 | 43 | 0.8 | 0.2 | 0.5 | 0.1 | 0.4 | 0.1 |
| 5117 | D | 1 | 3.6 | 600 | 30 | 116 | 42 | 145 | 52 | 190 | 68 | 0.4 | 0.1 | 0.9 | 0.3 | 5.9 | 2.1 |
| 5118 | D | 1 | 2.9 | 950 | 30 | 225 | 81 | 130 | 47 | 370 | 133 | 3.8 | 1.4 | 1.0 | 0.4 | 11.2 | 4.0 |
| 5119 | D | 9 | 2.8 | 1325 | 10 | 500 | 60 | 83 | 10 | 555 | 67 | 9.3 | 1.1 | 3.2 | 0.4 | 32.8 | 3.9 |
| 5120 | D | 9 | 2.7 | 1125 | 32 | 415 | 159 | 128 | 49 | 585 | 225 | 9.0 | 3.5 | 3.9 | 1.5 | 35.5 | 13.6 |
| 5121 | R | 9 | 4.2 | 1700 | 5 | 408 | 24 | 725 | 44 | 1300 | 78 | 0.4 | 0.0 | 8.0 | 0.5 | 31.5 | 1.9 |
| 5122 | R | 10 | 3.4 | 150 | 8 | 150 | 14 | 51 | 5 | 40 | 4 | 1.3 | 0.1 | 0.9 | 0.1 | 1.7 | 0.2 |
| 5123 | D | 13 | 2.8 | 610 | 90 | 110 | 119 | 98 | 106 | 215 | 232 | 5.9 | 6.4 | 0.3 | 0.3 | 3.5 | 3.8 |
| 5124 | D | 13 | 3.2 | 750 | 24 | 73 | 21 | 331 | 95 | 400 | 115 | 1.5 | 0.4 | 1.2 | 0.3 | 3.3 | 1.0 |
| 5127 | R | 5 | 3.0 | 1400 | 140 | 700 | 1176 | 83 | 139 | 720 | 1210 | 58.8 | 98.8 | 3.3 | 5.5 | 53.9 | 90.6 |
| 5128 | CO | 5 | - | 148 | 5 | -9 | -1 | 75 | 5 | 45 | 3 | 1.2 | 0.1 | 0.1 | 0.0 | 1.0 | 0.1 |
| 5129 | Sh | 1 | 5.0 | 2200 | 3784 | 500 | 22,704 | 730 | 33,148 | 1230 | 55,852 | 205.0 | 9308.6 | 5.5 | 249.7 | 9.8 | 445.0 |
| 5130 | D | 4 | 3.8 | 2800 | 1039 | 735 | 9,164 | 840 | 10,473 | 1750 | 21,819 | 210.0 | 2618.3 | 6.4 | 79.8 | 23.4 | 291.8 |
| 5131 | D | 4 | 6.2 | 1900 | 60 | -125 | -90 | 1080 | 778 | 1025 | 738 | 234.0 | 166.5 | 2.7 | 1.9 | 1.6 | 1.2 |
| 5132 | D | 1 | 2.8 | 1500 | 12 | 495 | 71 | 166 | 24 | 680 | 98 | 64.4 | 9.3 | 0.6 | 0.1 | 18.2 | 2.6 |
| 5133 | D | 1 | 3.2 | 840 | 1 | 97 | 1 | 277 | 3 | 370 | 4 | 3.0 | 0.0 | 3.4 | 0.0 | 4.8 | 0.1 |
| 5134 | D | 1 | 2.6 | 2000 | 90 | 545 | 589 | 560 | 604 | 900 | 972 | 27.9 | 30.1 | 1.9 | 2.1 | 26.4 | 28.5 |
| 5135 | D | 4 | 2.7 | 1900 | 90 | 430 | 464 | 620 | 670 | 1100 | 1188 | 7.1 | 7.7 | 3.3 | 3.6 | 24.4 | 26.4 |
| 5136 | S | 4 | 4.0 | 460 | 2 | 66 | 2 | 272 | 7 | 365 | 9 | 3.2 | 0.1 | 2.7 | 0.1 | 2.5 | 0.1 |
| 5137 | R | 4 | 3.0 | 440 | 5 | 63 | 4 | 120 | 7 | 160 | 10 | 1.0 | 0.1 | 0.6 | 0.0 | 4.1 | 0.2 |
| 5138 | R | 5 | 3.0 | 6000 | 30 | 4000 | 1440 | 495 | 178 | 5175 | 1863 | 12.9 | 4.6 | 35.1 | 12.6 | 315.5 | 113.6 |
| 5139 | D | 15 | 3.2 | 1600 | 3 | 415 | 15 | 490 | 18 | 800 | 29 | 9.7 | 0.3 | 3.6 | 0.1 | 16.1 | 0.6 |
| 5140 | D | 15 | 2.8 | 2200 | 40 | 995 | 478 | 110 | 53 | 1110 | 533 | 134.8 | 64.7 | 1.8 | 0.9 | 43.9 | 21.1 |

## LITTLE CONEMAUGH RIVER

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/1 | Acidity lb/day | Hardness mg/1 | Hardness lb/day | Sulfate mg/1 | Sulfate lb/day | Total Iron mg/1 | Total Iron lb/day | Manganese mg/1 | Manganese lb/day | Aluminum mg/1 | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5141 | S | 16 | 3.7 | 1100 | 2 | 442 | 11 | 154 | 4 | 540 | 13 | 9.7 | 0.2 | 5.5 | 0.1 | 35.1 | 0.8 |
| 5142 | S | 15 | 3.8 | 340 | 50 | 93 | 56 | 63 | 38 | 120 | 72 | 1.5 | 0.9 | 0.8 | 0.5 | 5.3 | 3.2 |
| 5144 | S | 15 | 4.0 | 80 | 3 | 74 | 3 | 27 | 1 | 20 | 1 | 0.3 | 0.0 | 0.1 | 0.0 | 2.5 | 0.1 |
| 5145 | S | 5 | 4.7 | 540 | 2 | 27 | 1 | 262 | 6 | 280 | 7 | 0.6 | 0.0 | 0.5 | 0.0 | 0.9 | 0.0 |
| 5154 | Sh | 15 | 3.1 | 850 | 1730 | 300 | 6228 | 146 | 3031 | 530 | 11,003 | 48.0 | 996.5 | 4.2 | 87.2 | 12.3 | 255.3 |
| 5155 | C | 5 | 3.4 | 1280 | 23 | 380 | 105 | 222 | 61 | 600 | 166 | 46.5 | 12.8 | 6.2 | 1.7 | 13.1 | 3.6 |
| 5156 | C | 5 | 2.8 | 1400 | 2 | 615 | 15 | 67 | 2 | 705 | 17 | 88.2 | 2.1 | 2.8 | 0.1 | 26.0 | 0.6 |
| 5157 | S | 5 | 3.1 | 700 | 2 | 160 | 4 | 29 | 1 | 150 | 4 | 9.6 | 0.2 | 1.9 | 0.0 | 6.8 | 0.2 |
| 5158 | B | 11 | 3.4 | 1000 | 18 | 345 | 75 | 49 | 11 | 400 | 86 | 99.1 | 21.4 | 1.2 | 0.3 | 6.9 | 1.5 |
| 5159 | D | 11 | 2.4 | 3400 | 62 | 1080 | 804 | 670 | 498 | 1720 | 1280 | 167.8 | 124.8 | 6.3 | 4.7 | 72.9 | 54.2 |
| 5160 | D | 11 | 3.1 | 650 | 3 | 85 | 3 | 214 | 8 | 290 | 10 | 0.9 | 0.0 | 0.3 | 0.0 | 3.4 | 0.1 |
| 5161 | B | 2 | 2.8 | 1900 | 3 | 715 | 26 | 315 | 11 | 950 | 34 | 19.9 | 0.7 | 6.7 | 0.2 | 71.1 | 2.6 |
| 5162 | B | 2 | 4.2 | 3500 | 3 | 2490 | 90 | 435 | 16 | 2970 | 107 | 3.8 | 0.1 | 10.9 | 0.4 | 348.0 | 12.5 |
| 5256 | D | 19 | 2.9 | 3500 | 75 | 1700 | 1530 | 536 | 482 | 2475 | 2228 | 264.0 | 237.6 | 5.4 | 4.9 | 108.0 | 97.2 |
| 5257 | D | 19 | 2.9 | 4000 | 75 | 2020 | 1818 | 640 | 576 | 2800 | 2520 | 303.0 | 272.7 | 6.2 | 5.6 | 128.1 | 115.3 |
| 5260 | Sh | 4 | 2.8 | 2200 | 289 | 640 | 2220 | 124 | 430 | 650 | 2254 | 51.4 | 178.3 | 4.1 | 14.2 | 44.7 | 155.0 |
| 5290 | Sh | 11 | 2.5 | 2040 | 2282 | 415 | 11,364 | 760 | 20,819 | 1275 | 34,915 | 128.5 | 3518.8 | 7.0 | 191.7 | 9.1 | 249.2 |
| 5086 | Sh | 1 | 3.9 | 1400 | 12 | 232 | 33 | 710 | 102 | 920 | 132 | 4.6 | 0.7 | 1.2 | 0.9 | 9.9 | 1.4 |
| 5104 | DA | 1 | 3.9 | 838 | 4 | 165 | 8 | 225 | 11 | 355 | 17 | 44.0 | 2.1 | 0.6 | 0.0 | 5.0 | 0.2 |
| 5143 | SA | 15 | 2.8 | 4000 | 10 | 2445 | 293 | 316 | 38 | 2750 | 330 | 10.1 | 1.2 | 14.1 | 1.7 | 51.9 | 6.2 |
| 5190 | DA | 1 | 4.2 | 2500 | 363 | 2500 | 1415 | 452 | 1969 | 1200 | 5227 | 72.0 | 313.6 | 1.2 | 5.2 | 7.4 | 32.2 |

*Average of two samples

## APPENDIX H

## STONY CREEK

Codes for tabular data page H-1 through H-8

### Source Type

C - Combination Mine

D - Drift Mine

S - Strip Mine

Sh-Shaft Mine

R - Refuse Pile

P - Preparation Plant

A - Active

* - Tunnel

### Receiving Stream

1. Stony Creek
2. Paint Creek
3. Little Paint Creek
4. Seese Run
5. Weaver Run
6. Shade Creek
7. Dark Shade Creek
8. Little Dark Shade Creek
9. Laurel Run
10. Beaverdam Run (Shade Creek)
11. Miller Run
12. Roaring Fork
13. Solomon Run
14. Falls Run
15. Wells Creek
16. Oven Run
17. Bens Creek
18. S. F. Bens Creek
19. Soap Hollow Run
20. Reitz Creek
21. Schrock Run
22. Beaverdam Creek (Stony Creek)
23. Roaring Run
24. Quemahoning Creek
25. Higgins Run
26. Twomile Run
27. Lamberts Run
28. Spruce Run
29. Boone Run
30. Beaverdam Creek (Quemahoning)
31. Grove Run
32. Calenders Run
33. Clear Run

## STONY CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5251 | D | 13 | 6.9 | 800 | 30 | -67 | -25 | 396 | 142 | 370 | 133 | 0.7 | 0.3 | 0.0 | 0.0 | 0.2 | 0.0 |
| 5252 | D | 13 | 4.7 | 900 | 40 | 108 | 52 | 338 | 162 | 570 | 274 | 25.3 | 12.1 | 0.9 | 0.4 | 4.6 | 2.2 |
| 5253 | D | 13 | 3.2 | 1200 | 85 | 168 | 171 | 344 | 351 | 480 | 490 | 2.3 | 2.3 | 0.6 | 0.6 | 7.8 | 8.0 |
| 5254 | D | 14 | 4.6 | 650 | 20 | 77 | 18 | 244 | 59 | 345 | 83 | 3.3 | 0.8 | 0.4 | 0.1 | 5.1 | 1.2 |
| 5255 | D | 14 | 3.5 | 1400 | 15 | 358 | 64 | 352 | 63 | 780 | 140 | 27.7 | 4.9 | 1.2 | 0.2 | 21.9 | 3.9 |
| 5280 | D | 6 | 7.5 | 650 | 5 | -33 | -2 | 330 | 20 | 315 | 19 | 0.9 | 0.0 | 0.3 | 0.0 | 0.2 | 0.0 |
| 5281 | D | 6 | 3.2 | 1900 | 20 | 380 | 91 | 370 | 89 | 625 | 150 | 26.3 | 6.3 | 2.5 | 0.6 | 17.5 | 4.2 |
| 5282 | C | 10 | 3.0 | 860 | 45 | 249 | 134 | 180 | 97 | 420 | 227 | 10.7 | 5.8 | 5.1 | 2.8 | 12.3 | 6.6 |
| 5283 | S | 9 | 3.0 | 1450 | 95 | 395 | 450 | 270 | 308 | 460 | 524 | 17.0 | 19.4 | 5.8 | 6.6 | 21.1 | 24.1 |
| 5284 | S | 9 | 3.0 | 1300 | 20 | 405 | 97 | 64 | 15 | 315 | 76 | 21.5 | 5.1 | 7.7 | 1.8 | 24.4 | 5.9 |
| 5285 | S | 11 | 2.3 | 3500 | 2 | 1040 | 25 | 645 | 15 | 2025 | 49 | 318.0 | 7.6 | 12.4 | 0.3 | 71.5 | 1.7 |
| 5288 | D | 11 | 3.7 | 900 | 93 | 152 | 170 | 342 | 382 | 470 | 525 | 17.7 | 19.8 | 4.9 | 5.5 | 2.9 | 3.2 |
| 5289 | D | 6 | 3.1 | 800 | 12 | 216 | 31 | 61 | 9 | 100 | 14 | 5.7 | 0.8 | 4.1 | 0.6 | 4.0 | 0.6 |
| 5293 | D | 7 | 3.1 | 2900 | 875 | 430 | 4515 | 324 | 1402 | 735 | 7717 | [illegible] | 1659.0 | 8.7 | 91.4 | 31.0 | 325.5 |
| 5294 | D | 7 | 3.7 | 1450 | 200 | 282 | 677 | 320 | 768 | 440 | 1056 | 15.2 | 36.5 | 5.1 | 12.2 | 17.0 | 40.8 |
| 5295 | S | 12 | 3.3 | 700 | 5 | 212 | 13 | 87 | 5 | 170 | 10 | 1.3 | 0.0 | 5.5 | 0.3 | 7.8 | 0.5 |
| 5298 | C | 6 | 4.0 | 750 | 3 | 154 | 6 | 172 | 6 | 330 | 12 | 5.1 | 0.2 | 7.0 | 0.3 | 5.6 | 0.2 |
| 5299 | C | 6 | 3.5 | 900 | 24 | 259 | 75 | 165 | 48 | 340 | 98 | 15.7 | 4.5 | 7.9 | 2.3 | 6.4 | 1.8 |
| 5300 | S | 6 | 3.3 | 1100 | 1 | 168 | 6 | 312 | 11 | 470 | 17 | [illegible] | 5.3 | 5.3 | 0.2 | 0.3 | 0.0 |
| 5304 | S | 2 | 3.4 | 600 | 65 | 374 | 292 | 81 | 63 | 410 | 320 | 7.0 | 5.5 | 5.6 | 4.4 | 25.8 | 20.1 |
| 5305 | D | 2 | 2.6 | 1500 | 4 | 975 | 47 | 30 | 1 | 1000 | 48 | 200.4 | 9.6 | 5.3 | 0.3 | 43.8 | 2.1 |
| 5306 | C | 2 | 3.1 | 1300 | 32 | 476 | 183 | 595 | 228 | 1160 | 445 | 4.0 | 1.5 | 11.7 | 4.5 | 16.8 | 6.5 |
| 5307 | S | 2 | 3.2 | 1600 | 30 | 380 | 137 | 484 | 174 | 960 | 346 | 1.8 | 0.6 | 6.1 | 2.2 | 13.0 | 4.7 |
| 5309 | D | 2 | 3.0 | 1800 | 25 | 459 | 138 | 640 | 192 | 1080 | 324 | 6.3 | 1.9 | 15.4 | 4.6 | 15.7 | 4.7 |
| 5310 | D | 2 | 3.0 | 1500 | 30 | 376 | 135 | 377 | 136 | 860 | 310 | 5.0 | 1.8 | 6.5 | 2.3 | 13.6 | 4.9 |
| 5311 | D | 2 | 2.9 | 1500 | 65 | 380 | 296 | 500 | 390 | 840 | 655 | 0.8 | 0.6 | 5.3 | 4.1 | 11.1 | 8.7 |

## STONY CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5312 | D | 2 | 2.9 | 1600 | 80 | 250 | 240 | 690 | 662 | 864 | 829 | 0.8 | 0.8 | 3.4 | 3.2 | 7.1 | 6.8 |
| 5313 | D | 2 | 3.1 | 1000 | 4 | 235 | 11 | 330 | 16 | 600 | 29 | 3.4 | 0.7 | 2.0 | 0.1 | 6.3 | 0.3 |
| 5314 | C | 4 | 3.4 | 1600 | 15 | 539 | 97 | 444 | 80 | 1120 | 202 | 7.8 | 1.4 | 22.2 | 4.0 | 16.6 | 3.0 |
| 5315 | S | 5 | 3.7 | 650 | 2 | 111 | 3 | 290 | 7 | 370 | 9 | 7.0 | 0.2 | 9.7 | 0.2 | 2.7 | 0.0 |
| 5316 | S | 5 | 2.4 | 1000 | 11 | 1660 | 219 | 210 | 28 | 360 | 48 | 8.1 | 1.1 | 7.1 | 0.9 | 4.9 | 0.6 |
| 5317 | C | 5 | 2.5 | 3000 | 120 | 289 | 416 | 186 | 267 | 350 | 504 | 10.3 | 14.8 | 5.6 | 8.1 | 16.9 | 24.3 |
| 5318 | D | 5 | 3.4 | 750 | 4 | 107 | 5 | 150 | 7 | 220 | 11 | 2.9 | 0.1 | 3.6 | 0.1 | 4.6 | 0.2 |
| 5319 | S | 5 | 3.5 | 1000 | 24 | 164 | 47 | 236 | 68 | 390 | 112 | 1.4 | 0.4 | 1.7 | 0.5 | 7.5 | 2.2 |
| 5320 | D | 2 | 6.6 | 1800 | 48 | 94 | 54 | 1140 | 657 | 1240 | 714 | 1.2 | 0.7 | 1.6 | 0.9 | 3.1 | 1.8 |
| 5321 | D | 1 | 4.9 | 650 | 70 | 95 | 80 | 125 | 105 | 25 | 21 | 3.7 | 3.1 | 0.9 | 0.8 | 0.1 | 0.0 |
| 5322 | D | 2 | 3.2 | 2000 | 36 | 161 | 70 | 860 | 371 | 1200 | 518 | 10.3 | 4.4 | 6.4 | 2.8 | 11.3 | 4.9 |
| 5323 | S | 2 | 3.2 | 1900 | 3 | 333 | 12 | 700 | 25 | 1075 | 39 | 5.8 | 0.2 | 5.1 | 0.2 | 11.9 | 0.4 |
| 5324 | D | 2 | 2.6 | 4000 | 6 | 1720 | 124 | 745 | 54 | 2350 | 169 | 308.0 | 22.2 | 7.6 | 0.5 | 63.9 | 4.6 |
| 5325 | D | 2 | 3.6 | 1500 | 3 | 305 | 11 | 600 | 22 | 920 | 33 | 19.1 | 0.7 | 7.1 | 0.3 | 15.4 | 0.6 |
| 5326 | D | 2 | 3.9 | 2000 | 34 | 780 | 37 | 430 | 21 | 1375 | 66 | 0.5 | 0.0 | 22.0 | 1.1 | 33.1 | 1.6 |
| 5327 | D | 2 | 2.7 | 3000 | 180 | 820 | 1771 | 652 | 1408 | 1330 | 2873 | 44.6 | 96.3 | 6.0 | 12.9 | 25.3 | 54.6 |
| 5328 | D | 2 | 3.3 | 5000 | 10 | 1240 | 149 | 1160 | 139 | 2725 | 327 | 119.3 | 14.3 | 10.1 | 1.2 | 28.4 | 3.4 |
| 5329 | D | 2 | 3.0 | 6000 | 40 | 1890 | 907 | 1620 | 778 | 3375 | 1620 | 320.1 | 153.6 | 8.2 | 3.9 | 57.8 | 27.7 |
| 5330 | D | 1 | 4.0 | 2300 | 30 | 540 | 194 | 608 | 219 | 1470 | 529 | 38.3 | 13.8 | 2.6 | 0.9 | 17.1 | 6.2 |
| 5331 | D | 1 | 4.2 | 2500 | 110 | 595 | 785 | 700 | 924 | 1680 | 2218 | 60.7 | 80.1 | 4.3 | 5.7 | 20.7 | 27.3 |
| 5332 | D | 1 | 5.0 | 750 | 10 | -39 | -5 | 316 | 38 | 350 | 42 | 2.3 | 0.3 | 0.7 | 0.1 | 0.3 | 0.0 |
| 5333 | D | 1 | 3.0 | 1800 | 480 | 575 | 3312 | 476 | 2736 | 1040 | 5990 | 19.4 | 111.8 | 2.8 | 16.1 | 18.1 | 104.3 |
| 5334 | D | 1 | 3.1 | 2600 | 42 | 705 | 355 | 960 | 484 | 1680 | 847 | 36.4 | 18.3 | 8.2 | 4.1 | 5.1 | 2.6 |
| 5335 | D | 1 | 3.1 | 3000 | 5 | 1155 | 69 | 1070 | 64 | 2275 | 137 | 200.0 | 120.0 | 11.4 | 0.6 | 2.3 | 0.1 |
| 5336 | D | 1 | 5.0 | 1500 | 50 | 268 | 161 | 446 | 268 | 820 | 492 | 43.7 | 26.2 | 3.5 | 2.1 | 0.3 | 0.2 |
| 5337 | D | 1 | 5.4 | 1100 | 30 | 77 | 28 | 370 | 133 | 480 | 173 | 3.2 | 1.2 | 0.6 | 0.2 | 1.4 | 0.5 |
| 5338 | Sh | 1 | 2.8 | 2800 | 120 | 1665 | 2,398 | 615 | 886 | 1960 | 2822 | 183.0 | 263.5 | 6.6 | 9.5 | 53.0 | 76.3 |

STONY CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5339 | D | 13 | 2.8 | 3000 | 8 | 870 | 84 | 326 | 31 | 1050 | 101 | 63.5 | 6.1 | 2.1 | 0.2 | 37.2 | 3.6 |
| 5340 | D | 1 | 2.7 | 2400 | 20 | 875 | 210 | 276 | 56 | 1110 | 266 | 107.1 | 25.7 | 2.1 | 0.5 | 2.5 | 0.6 |
| 5341 | D | 1 | 3.1 | 1200 | 16 | 315 | 60 | 284 | 54 | 615 | 118 | 4.6 | 0.9 | 1.6 | 0.3 | 0.8 | 0.2 |
| 5342 | D | 1 | 2.8 | 2600 | 23 | 655 | 181 | 324 | 89 | 960 | 265 | 60.0 | 1.7 | 2.6 | 0.8 | 17.9 | 4.9 |
| 5343 | D | 1 | 2.8 | 3000 | 95 | 795 | 906 | 680 | 775 | 1540 | 1756 | 46.6 | 53.1 | 6.6 | 7.5 | 23.4 | 26.7 |
| 5344 | D | 1 | 2.8 | 3000 | 20 | 670 | 161 | 620 | 149 | 1190 | 286 | 44.1 | 10.6 | 6.5 | 1.6 | 17.7 | 4.2 |
| 5345 | C | 1 | 2.9 | 1330 | 16 | 249 | 48 | 444 | 85 | 705 | 135 | 3.2 | 0.6 | 2.3 | 0.4 | 5.3 | 1.0 |
| 5346 | D | 1 | 2.9 | 2400 | 41 | 730 | 359 | 620 | 305 | 1380 | 679 | 38.5 | 18.9 | 6.8 | 3.3 | 22.6 | 11.2 |
| 5348 | D | 1 | 3.4 | 1500 | 26 | 400 | 125 | 312 | 97 | 680 | 212 | 2.9 | 0.9 | 1.9 | 0.6 | 19.3 | 6.0 |
| 5349 | D | 1 | 3.6 | 1800 | 5 | 290 | 17 | 430 | 26 | 740 | 44 | 0.3 | 0.0 | 2.5 | 0.2 | 8.5 | 0.5 |
| 5350 | D | 1 | 3.5 | 1600 | 30 | 250 | 90 | 400 | 144 | 640 | 230 | 3.2 | 1.2 | 2.6 | 0.9 | 11.5 | 4.1 |
| 5374 | D | 24 | 8.5 | 440 | 12 | -75 | -11 | 127 | 18 | 90 | 13 | 0.7 | 0.1 | 1.1 | 0.2 | 0.0 | 0.0 |
| 5375 | S | 24 | 4.4 | 2300 | 18 | 685 | 148 | 464 | 100 | 1290 | 279 | 74.4 | 16.0 | 40.0 | 8.6 | 7.2 | 1.5 |
| 5376 | D | 23 | 6.8 | 1300 | 12 | 450 | 65 | 196 |  | 720 | 104 | 124.4 | 17.9 | 6.9 | 0.9 | 1.8 | 0.3 |
| 5377 | D | 25 | 7.6 | 370 | 8 | -132 | -13 | 42 | 4 | 10 | 1 | 0.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 5380 | D | 2 | 3.9 | 1500 | 956 | 310 | 3,556 | 354 | 4061 | 704 | [illegible] | 7.1 | 33.7 | 4.5 | 51.6 | 6.8 | 78.0 |
| 5387 | D | 26 | 2.9 | 3000 | 6 | 1080 | 78 | 306 | 22 | 1295 | 93 | 35.[illegible] | 2.5 | 16.8 | 1.2 | 73.9 | 5.3 |
| 5388 | D | 26 | 3.0 | 3100 | 10 | 1240 | 149 | 318 | 38 | 1490 | 179 | 55.[illegible] | 6.7 | 10.8 | 1.3 | 74.5 | 8.9 |
| 5389 | S | 26 | 4.4 | 1650 | 5 | 595 | 36 | 364 | 22 | 1060 | 64 | [illegible] | 1.7 | [illegible] | 1.7 | 26.9 | 1.6 |
| 5390 | [illegible] | 26 | 3.7 | 850 | 8 | 250 | 24 | 125 | 12 | 365 | 35 | 6.[illegible] | 0.6 | 9.2 | 0.8 | 6.8 | 0.7 |
| 5391 | S | 26 | 2.9 | 3000 | 2 | 1090 | 26 | 375 | 9 | 1505 | 36 | 31.[illegible] | 0.7 | 23.5 | 0.6 | 35.4 | 0.8 |
| 5392 | Sh | 24 | 7.6 | 2300 | [illegible] | 322 | 8 | 790 | 19 | 1200 | 29 | 89.[illegible] | 2.1 | 2.1 | 0.0 | 0.1 | 0.0 |
| 5393 | D | 24 | 3.0 | 2800 | 1 | 600 | 7 | 254 | 3 | 630 | 8 | 35.[illegible] | 0.4 | 2.7 | 0.0 | 13.8 | 0.2 |
| 5394 | D | 24 | 3.6 | 2500 | 1 | 935 | 11 | 254 | 3 | 1140 | 14 | 62.[illegible] | 0.7 | 34.0 | 0.4 | 51.9 | 0.6 |
| 5395 | S | 24 | 3.1 | 3800 | 1 | 1650 | 20 | 935 | 11 | 2610 | 31 | 258.8 | 3.1 | 62.2 | 0.8 | 15.0 | 0.2 |
| 5396 | C | 24 | 6.1 | 990 | 35 | 182 | 76 | 298 | 125 | 510 | 214 | 28.1 | 11.8 | 8.3 | 3.5 | 0.6 | 0.3 |

## STONY CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity | | Hardness | | Sulfate | | Total Iron | | Manganese | | Aluminum | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | mg/1 | lb/day | mg/1 | lb/day | mg/1 | lb/day | mg/1 | lb/day | mg/1 | lb/day | mg/1 | lb/day |
| 5397 | D | 24 | 6.5 | 850 | 24 | 178 | 51 | 293 | 84 | 470 | 35 | 15.6 | 4.5 | 1.4 | 0.4 | 6.6 | 1.9 |
| 5398 | D | 24 | 7.6 | 180 | 2 | 9 | 0 | 78 | 2 | 40 | 1 | 3.0 | 0.0 | 0.3 | 0.0 | 1.2 | 0.0 |
| 5399 | C | 24 | 6.5 | 1500 | 235 | 325 | 917 | 380 | 1072 | 720 | 2030 | 51.0 | 143.8 | 5.0 | 14.1 | 6.8 | 19.2 |
| 5400 | C | 24 | 5.5 | 1275 | 5 | 246 | 15 | 398 | 24 | 675 | 41 | 0.5 | 0.0 | 2.5 | 0.2 | 7.5 | 0.5 |
| 5401 | S | 6 | 3.5 | 900 | 25 | 93 | 28 | 270 | 81 | 400 | 120 | 13.5 | 4.1 | 5.4 | 1.6 | 0.0 | 0.0 |
| 5402 | D | 6 | 3.0 | 1100 | 25 | 240 | 72 | 186 | 56 | 90 | 27 | 7.1 | 2.1 | 5.4 | 1.6 | 1.9 | 0.6 |
| 5403 | D | 6 | 3.1 | 850 | 24 | -40 | -12 | 176 | 51 | 140 | 40 | 1.1 | 0.3 | 0.1 | 0.0 | 0.0 | 0.0 |
| 5404 | D | 17 | 2.8 | 4500 | 6 | 2500 | 180 | 1201 | 86 | 3200 | 230 | 355.2 | 25.6 | 5.7 | 0.4 | 53.0 | 3.8 |
| 5405 | D | 18 | 2.8 | 3000 | 3 | 1220 | 44 | 262 | 9 | 1650 | 60 | 161.5 | 5.8 | 3.6 | 0.1 | 45.7 | 1.6 |
| 5406 | D | 18 | 2.6 | 6000 | 4 | 3350 | 161 | 270 | 13 | 3350 | 161 | 840.8 | 40.4 | 5.6 | 0.3 | 87.4 | 4.2 |
| 5407 | D | 18 | 2.9 | 4000 | 30 | 2525 | 909 | 495 | 178 | 2800 | 1008 | 232.4 | 101.6 | 4.9 | 1.8 | 63.5 | 22.9 |
| 5408 | D | 18 | 2.6 | 4000 | 2 | 1770 | 42 | 240 | 6 | 1600 | 38 | 414.4 | 9.9 | 2.7 | 0.0 | 49.0 | 1.2 |
| 5409 | D | 18 | 5.1 | 360 | 1 | 7 | 0 | 63 | 1 | 40 | 1 | 9.0 | 0.1 | 0.2 | 0.0 | 0.9 | 0.0 |
| 5410 | D | 18 | 2.5 | 3000 | 3 | 1335 | 48 | 307 | 11 | 1645 | 60 | 186.2 | 6.7 | 7.3 | 0.3 | 52.6 | 1.9 |
| 5411 | D | 18 | 7.4 | 1500 | 1256 | 148 | 2231 | 555 | 8,365 | 700 | 10,550 | 8.4 | 126.6 | 1.2 | 18.1 | 0.2 | 3.0 |
| 5412 | S | 18 | 2.7 | 4000 | 4 | 1910 | 92 | 360 | 17 | 1900 | 91 | 291.4 | 14.0 | 6.7 | 0.3 | 73.1 | 3.5 |
| 5413 | D | 19 | 2.9 | 1600 | 75 | 350 | 315 | 442 | 398 | 800 | 720 | 16.5 | 14.9 | 1.2 | 1.1 | 6.3 | 5.6 |
| 5414 | D | 1 | 2.8 | 1700 | 3 | 620 | 22 | 172 | 6 | 840 | 30 | 64.5 | 2.3 | 1.6 | 0.0 | 3.1 | 0.1 |
| 5415 | D | 1 | 4.1 | 6000 | 630 | 3550 | 26,838 | 140 | 1058 | 5100 | 38,556 | [illegible] | 4542.8 | 10.2 | 77.1 | 80.6 | 609.3 |
| 5416 | D | 1 | 4.2 | 2200 | 30 | 565 | 203 | 600 | 216 | 1525 | 549 | 32.9 | 11.8 | 5.1 | 1.8 | 16.1 | 5.8 |
| 5417 | D | 1 | 7.4 | 1600 | 1 | -115 | -1 | 104 | 1 | 280 | 3 | 1.1 | 0.0 | 0.4 | 0.0 | 0.0 | 0.0 |
| 5418 | D | 1 | 7.2 | 1600 | 30 | -211 | -76 | 86 | 31 | 340 | 122 | 7.5 | 2.7 | 0.5 | 0.2 | 0.0 | 0.0 |
| 5419 | D | 1 | 7.2 | 1600 | 130 | -228 | -356 | 103 | 161 | 320 | 499 | 7.3 | 11.4 | 0.6 | 0.9 | 0.0 | 0.0 |
| 5420 | * | 1 | 3.2 | 1200 | 10 | 215 | 26 | 137 | 16 | 510 | 61 | 8.2 | 1.0 | 10.9 | 1.3 | 2.5 | 0.3 |
| 5421 | D | 1 | 3.9 | 2400 | 130 | 560 | 874 | 500 | 780 | 1140 | 1778 | 89.2 | 139.1 | 2.5 | 3.9 | 13.7 | 21.4 |
| 5423 | D | 1 | 6.9 | 950 | [illegible] | 149 | 7 | 272 | 13 | 410 | 20 | [illegible] | 0.3 | 0.5 | 0.0 | 7.3 | 0.4 |
| 5424 | D | 15 | 3.1 | 1200 | 222 | 165 | 440 | 270 | 719 | 375 | 999 | 6.4 | 17.0 | 2.9 | 7.7 | 4.2 | 11.1 |
| 5425 | D | 15 | 2.8 | 2200 | 185 | 430 | 955 | 380 | 843 | 675 | 1499 | 54.6 | 121.2 | 6.5 | 14.4 | 11.4 | 25.3 |

STONY CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5426 | S | 15 | 2.9 | 2800 | 5 | 750 | 45 | 450 | 27 | 840 | 50 | 32.2 | 1.9 | 7.4 | 0.4 | 15.5 | 0.9 |
| 5427 | D | 15 | 3.1 | 1300 | 225 | 450 | 1215 | 457 | 1234 | 765 | 2065 | 6.4 | 17.3 | 8.5 | 22.9 | 11.1 | 29.9 |
| 5451 | C | 1 | 6.6 | 500 | 12 | 71 | 10 | 200 | 29 | 245 | 35 | 18.8 | 2.7 | 1.0 | 0.1 | 0.0 | 0.0 |
| 5452 | P | 1 | 4.0 | 700 | 2 | 110 | 3 | 276 | 7 | 380 | 9 | 2.7 | 0.0 | 0.9 | 0.0 | 1.4 | 0.0 |
| 5453 | D | 1 | 5.1 | 750 | 12 | 69 | 10 | 342 | 49 | 400 | 58 | 7.1 | 1.0 | 1.3 | 0.2 | 0.1 | 0.0 |
| 5454 | D | 1 | 3.0 | 2700 | 25 | 1265 | 380 | 386 | 116 | 1785 | 534 | 160.0 | 48.0 | 9.0 | 2.7 | 60.5 | 18.2 |
| 5455 | D | 1 | 3.3 | 1100 | 180 | 211 | 456 | 320 | 691 | 550 | 1188 | 1.3 | 2.8 | 3.7 | 8.0 | 6.6 | 14.3 |
| 5456 | D | 1 | 3.2 | 1200 | 215 | 286 | 738 | 354 | 913 | 630 | 1625 | 4.1 | 10.6 | 1.5 | 3.9 | 11.1 | 28.6 |
| 5457 | C | 1 | 3.0 | 1600 | 120 | 450 | 648 | 294 | 423 | 800 | 1152 | 35.1 | 50.5 | 2.1 | 3.0 | 20.8 | 29.9 |
| 5458 | C | 1 | 6.1 | 625 | 3 | 92 | 3 | 298 | 11 | 330 | 12 | 1.4 | 0.0 | 1.1 | 0.0 | 1.4 | 0.0 |
| 5459 | D | 1 | 3.9 | 750 | 1 | 140 | 2 | 202 | 2 | 320 | 4 | 2.1 | 0.0 | 2.6 | 0.0 | 2.4 | 0.0 |
| 5460 | D | 1 | 3.7 | 850 | 3 | 250 | 9 | 272 | 10 | 440 | 16 | 1.3 | 0.0 | 3.1 | 0.1 | 5.4 | 0.2 |
| 5461 | S | 1 | 7.1 | 100 | 0 | 32 | 0 | 36 | 0 | 20 | 0 | 0.6 | 0.0 | 0.1 | 0.0 | 0.4 | 0.0 |
| 5462 | D | 1 | 4.6 | 2000 | 8 | 715 | 69 | 435 | 42 | 1200 | 115 | 55.3 | 5.3 | 2.9 | 0.3 | 38.9 | 3.7 |
| 5463 | D | 1 | 4.7 | 1800 | 150 | 525 | 945 | 268 | 482 | 800 | 1440 | 26.9 | 48.4 | 3.6 | 6.5 | 20.5 | 36.9 |
| 5464 | D | 1 | 3.0 | 2700 | 141 | 735 | 1244 | 424 | 717 | 980 | 1658 | 41.3 | 69.8 | 3.6 | 6.1 | 22.3 | 37.7 |
| 5465 | D | 1 | 6.0 | 2200 | 8 | 715 | 69 | 352 | 34 | 1000 | 96 | 58.7 | 5.6 | 3.4 | 0.3 | 24.9 | 2.4 |
| 5466 | D | 1 | 3.2 | 1100 | 90 | 315 | 340 | 246 | 266 | 630 | 680 | 4.1 | 4.4 | 2.6 | 2.8 | 10.2 | 11.0 |
| 5467 | D | 1 | 3.2 | 1200 | 1 | 325 | 4 | 242 | 3 | 555 | 7 | 30.9 | 0.4 | 6.2 | 0.0 | 7.6 | 0.1 |
| 5468 | C | 1 | 3.0 | 1400 | 3 | 211 | 8 | 392 | 14 | 580 | 21 | 7.6 | 0.3 | 14.5 | 0.5 | 2.1 | 0.0 |
| 5469 | C | 1 | 3.0 | 1700 | 6 | 416 | 30 | 238 | 17 | 620 | 45 | 40.2 | 2.9 | 4.7 | 0.3 | 9.9 | 0.7 |
| 5470 | S | 1 | 3.0 | 2100 | 0 | 450 | 0 | 380 | 0 | 775 | 0 | 7.3 | 0.0 | 7.4 | 0.0 | 13.7 | 0.0 |
| 5471 | R | 1 | 3.0 | 10,000 | 3 | 25,000 | 900 | 17,000 | 612 | 23,500 | 846 | 2126.0 | 76.5 | 54.8 | 1.9 | 2630.0 | 94.7 |
| 5472 | R | 1 | 4.0 | 600 | 0 | 85 | 0 | 80 | 0 | 120 | 0 | 1.3 | 0 | 3.7 | 0 | 0.5 | 0 |
| 5473 | D | 1 | 3.0 | 2400 | 2 | 795 | 19 | 195 | 5 | 81 | 2 | 24.7 | 0.6 | 2.7 | 0.0 | 32.8 | 0.8 |
| 5474 | D | 1 | 4.9 | 1400 | 8 | 226 | 22 | 462 | 44 | 540 | 52 | 21.1 | 2.0 | 1.9 | 0.2 | 0.0 | 0.0 |
| 5475 | D | 1 | 3.0 | 3000 | 8 | 1115 | 107 | 460 | 44 | 1505 | 144 | 79.3 | 7.6 | 10.0 | 0.9 | 34.7 | 3.3 |

STONY CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/1 | Acidity lb/day | Hardness mg/1 | Hardness lb/day | Sulfate mg/1 | Sulfate lb/day | Total Iron mg/1 | Total Iron lb/day | Manganese mg/1 | Manganese lb/day | Aluminum mg/1 | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5477 | D | 1 | 3.0 | 2400 | 45 | 810 | 437 | 282 | 152 | 1110 | 599 | 85.8 | 46.3 | 5.1 | 2.8 | 25.5 | 13.8 |
| 5478 | D | 16 | 3.2 | 1200 | 5 | 240 | 14 | 200 | 12 | 375 | 23 | 58.1 | 3.4 | 4.4 | 0.3 | 0.0 | 0.0 |
| 5479 | S | 16 | 3.0 | 5500 | 8 | 3675 | 353 | 400 | 38 | 4575 | 439 | 344.3 | 33.0 | 143.8 | 13.8 | 97.4 | 9.4 |
| 5480 | S | 16 | 4.6 | 750 | 16 | 200 | 38 | 86 | 17 | 260 | 50 | 74.4 | 14.3 | 3.6 | 0.7 | 2.1 | 0.4 |
| 5481 | D | 1 | 3.0 | 1500 | 15 | 365 | 66 | 302 | 54 | 600 | 108 | 34.3 | 6.2 | 3.3 | 0.6 | 8.8 | 1.6 |
| 5482 | D | 1 | 3.0 | 2000 | 2 | 91 | 2 | 695 | 17 | 1075 | 26 | 4.0 | 0.1 | 6.2 | 0.1 | 12.9 | 0.3 |
| 5483 | D | 1 | 3.2 | 2500 | 24 | 377 | 109 | 910 | 262 | 1200 | 346 | 13.6 | 3.9 | 7.6 | 2.2 | 10.7 | 3.1 |
| 5484 | D | 1 | 3.0 | 3000 | 27 | 615 | 199 | 1080 | 350 | 1540 | 499 | 6.2 | 2.0 | 5.5 | 1.8 | 14.9 | 4.8 |
| 5485 | D | 1 | 3.0 | 4000 | 3 | 2825 | 102 | 540 | 19 | 2700 | 97 | 313.6 | 11.3 | 20.9 | 0.8 | 53.5 | 1.9 |
| 5486 | D | 1 | 3.0 | 2400 | 6 | 565 | 41 | 300 | 22 | 930 | 67 | 75.3 | 5.4 | 11.2 | 0.8 | 7.2 | 0.5 |
| 5487 | S | 16 | 5.0 | 2400 | 15 | 300 | 54 | 162 | 29 | 1230 | 221 | 17.2 | 3.1 | 5.1 | 0.9 | 0.8 | 0.1 |
| 5501 | D | 1 | 3.8 | 2000 | 90 | 357 | 386 | 466 | 503 | 775 | 837 | 0.8 | 0.9 | 2.0 | 2.1 | 15.1 | 16.3 |
| 5502 | D | 1 | 2.6 | 1700 | 420 | 760 | 3830 | 748 | 3770 | 1160 | 5486 | 27.3 | 137.6 | 5.0 | 25.2 | 12.8 | 64.5 |
| 5503 | S | 1 | 3.0 | 1500 | 35 | 610 | 256 | 485 | 204 | 900 | 378 | 41.5 | 17.4 | 12.3 | 5.2 | 22.2 | 9.3 |
| 5504 | D | 1 | 3.6 | 1000 | 270 | 320 | 1037 | 380 | 1231 | 700 | 2268 | 11.9 | 38.6 | 2.0 | 6.5 | 13.8 | 44.7 |
| 5505 | D | 1 | 7.2 | 525 | 60 | 32 | 23 | 258 | 186 | 255 | 183 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.2 |
| 5506 | D | 15 | 3.3 | 800 | 30 | 150 | 54 | 350 | 126 | 500 | 180 | 1.7 | 0.6 | 2.8 | 1.0 | 6.5 | 2.3 |
| 5507 | D | 15 | 4.1 | 950 | 4 | 112 | 5 | 354 | 17 | 440 | 21 | 2.0 | 0.1 | 1.6 | 0.1 | 3.2 | 0.2 |
| 5508 | D | 22 | 2.9 | 1000 | 95 | 169 | 193 | 400 | 456 | 525 | 599 | 2.1 | 2.4 | 0.8 | 0.9 | 5.9 | 6.7 |
| 5510 | S | 1 | 6.5 | 500 | 12 | 131 | 19 | 234 | 34 | 430 | 62 | 0.4 | 0.0 | 21.4 | 3.1 | 2.1 | 0.3 |
| 5511 | D | 20 | 2.6 | 2000 | 18 | 620 | 134 | 765 | 165 | 1175 | 254 | 44.7 | 9.6 | 15.0 | 3.2 | 15.2 | 3.3 |
| 5512 | C | 20 | 2.6 | 2000 | 22 | 505 | 133 | 610 | 161 | 1125 | 297 | 60.2 | 15.9 | 16.5 | 4.4 | 9.8 | 2.6 |
| 5513 | Sh | 1 | 3.1 | 2000 | 15 | 970 | 175 | 400 | 72 | 1400 | 252 | 235.5 | 42.4 | 13.4 | 2.4 | 16.6 | 2.9 |
| 5514 | S | 21 | 7.2 | 360 | 3 | -38 | -2 | 202 | 7 | 175 | 6 | 4.5 | 0.2 | 6.5 | 0.2 | 1.8 | 0.0 |
| 5515 | S | 21 | 7.7 | 330 | 6 | 28 | 2 | 129 | 9 | 120 | 0 | 0.4 | 0.0 | 0.8 | 0.0 | 1.9 | 0.1 |
| 5516 | S | 21 | 6.8 | 1900 | 60 | 332 | 240 | 1020 | 734 | 1400 | 008 | 23.2 | 16.7 | 23.1 | 16.6 | 1.6 | 1.2 |

## STONY CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/1 | Acidity lb/day | Hardness mg/1 | Hardness lb/day | Sulfate mg/1 | Sulfate lb/day | Total Iron mg/1 | Total Iron lb/day | Manganese mg/1 | Manganese lb/day | Aluminum mg/1 | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5517 | S | 21 | 7.4 | 1900 | 20 | 133 | 32 | 870 | 209 | 1025 | 246 | 0.5 | 0.1 | 13.6 | 3.3 | 2.1 | 0.5 |
| 5518 | D | 1 | 7.0 | 650 | 85 | 16 | 16 | 285 | 291 | 300 | 306 | 19.1 | 19.5 | 3.9 | 4.0 | 1.8 | 1.8 |
| 5519 | S | 1 | 7.6 | 380 | 10 | 6 | 1 | 242 | 29 | 205 | 25 | 0.4 | 0.0 | 0.8 | 0.1 | 1.6 | 0.2 |
| 5520 | C | 27 | 3.1 | 1100 | 63 | 255 | 193 | 288 | 218 | 555 | 420 | 6.5 | 4.9 | 10.4 | 7.9 | 6.2 | 4.7 |
| 5521 | C | 27 | 3.2 | 4000 | 10 | 2630 | 316 | 684 | 82 | 3250 | 390 | 401.0 | 48.1 | 105.0 | 12.6 | 57.0 | 6.8 |
| 5523 | S | 31 | 2.8 | 2000 | 36 | 800 | 346 | 750 | 324 | 1575 | 680 | 45.0 | 19.4 | 40.8 | 17.6 | 0.9 | 0.4 |
| 5525 | S | 32 | 4.0 | 1300 | 12 | 385 | 55 | 327 | 47 | 750 | 108 | 1.1 | 0.2 | 34.0 | 4.9 | 5.2 | 0.7 |
| 5526 | C | 29 | 7.5 | 1300 | 30 | 160 | 58 | 332 | 120 | 585 | 211 | 4.6 | 1.7 | 2.6 | 0.9 | 0.0 | 0.0 |
| 5527 | Sh | 29 | 3.2 | 3000 | 32 | 385 | 148 | 1430 | 549 | 1855 | 712 | 65.0 | 24.9 | 7.4 | 2.8 | 0.5 | 0.2 |
| 5528 | Sh | 29 | 2.5 | 3000 | 4 | 1725 | 83 | 348 | 17 | 1820 | 87 | 289.0 | 13.9 | 20.2 | 1.0 | 76.1 | 3.7 |
| 5551 | D | 12 | 3.5 | 850 | 55 | 250 | 165 | 98 | 65 | 320 | 211 | 3.9 | 2.6 | 5.1 | 3.4 | 11.9 | 7.9 |
| 5554 | D | 22 | 8.1 | 650 | 367 | 15 | 66 | 142 | 625 | 295 | 1299 | 0.8 | 3.5 | 1.0 | 4.4 | 2.0 | 8.8 |
| 5555 | C | 30 | 6.3 | 2300 | 1 | 346 | 4 | 970 | 12 | 1290 | 15 | 1.6 | 0.0 | 10.2 | 0.1 | 0.8 | 0.0 |
| 5557 | D | 30 | 3.4 | 1300 | 1 | 296 | 4 | 194 | 2 | 405 | 5 | 21.6 | 0.3 | 2.2 | 0.0 | 17.0 | 0.2 |
| 5556 | S | 23 | 7.8 | 1500 | 90 | 123 | 133 | 387 | 418 | 520 | 562 | 4.4 | 4.8 | 5.8 | 6.3 | 0.0 | 0.0 |
| 5559 | D | 24 | 7.4 | 2000 | 250 | 255 | 765 | 670 | 2010 | 1150 | 3450 | 29.0 | 87.0 | 4.2 | 12.6 | 0.1 | 0.3 |
| 5560 | D | 23 | 7.4 | 1300 | 6 | 420 | 30 | 230 | 17 | 750 | 54 | 146.0 | 10.5 | 9.1 | 0.7 | 0.0 | 0.0 |
| 5561 | D | 1 | 3.5 | 2000 | 24 | 600 | 173 | 324 | 93 | 925 | 266 | 62.0 | 17.9 | 2.4 | 0.7 | 36.3 | 10.5 |
| 5631 | S | 28 | 3.0 | 3500 | 0 | 1500 | 0 | 247 | 0 | 1665 | 0 | 316.0 | 0.0 | 18.8 | 0.0 | 57.3 | 0.0 |
| 5191 | AD | 3 | 2.9 | 2000 | 84 | 510 | 514 | 458 | 461 | 1075 | 1083 | 15.0 | 15.1 | 2.8 | 2.8 | 19.8 | 20.0 |
| 5286 | AS | 11 | 2.7 | 2600 | 5 | 1815 | 109 | 535 | 32 | 1620 | 97 | 246.0 | 14.8 | 30.4 | 1.8 | 24.1 | 1.4 |
| 5287 | AD | 11 | 2.6 | 1800 | 3 | 410 | 15 | 238 | 9 | 600 | 22 | 62.0 | 2.2 | 13.4 | 0.5 | 6.3 | 0.2 |
| 5296 | AD | 6 | 2.9 | 1100 | 30 | 207 | 75 | 276 | 99 | 920 | 331 | 19.9 | 7.2 | 3.0 | 1.1 | 17.6 | 6.3 |
| 5297 | AD | 6 | 3.7 | 800 | 15 | 98 | 18 | 410 | 74 | 450 | 81 | 2.8 | 0.5 | 2.6 | 0.5 | 7.4 | 1.3 |
| 5347 | AP | 3 | 4.6 | 1000 | 25 | 279 | 84 | 730 | 219 | 850 | 255 | 149.0 | 44.7 | 2.8 | 0.8 | 0.8 | 0.2 |
| 5378 | AD | 19 | 3.1 | 2000 | 1309 | 295 | 4634 | 466 | 7320 | 1075 | 16,886 | 21.1 | 331.4 | 3.5 | 54.9 | 5.5 | 86.4 |

STONY CREEK

| Mine No. | Source Type | Receiving Stream | pH | Specific Conductance | Flow | Acidity mg/l | Acidity lb/day | Hardness mg/l | Hardness lb/day | Sulfate mg/l | Sulfate lb/day | Total Iron mg/l | Total Iron lb/day | Manganese mg/l | Manganese lb/day | Aluminum mg/l | Aluminum lb/day |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5422 | AD | 1 | 2.9 | 7000 | 15 | 3275 | 590 | 775 | 140 | 3700 | 666 | 435.7 | 78.4 | 6.1 | 1.1 | 125.8 | 22.6 |
| 5509 | AS | 1 | 3.2 | 1900 | 4 | 405 | 19 | 585 | 28 | 875 | 42 | 24.0 | 1.2 | 11.1 | 0.5 | 8.9 | 0.4 |
| 5522 | AS | 27 | 7.0 | 950 | 245 | 81 | 238 | 328 | 964 | 410 | 1205 | 8.4 | 24.7 | 5.9 | 17.3 | 0.1 | 0.3 |
| 5524 | AS | 33 | 7.5 | 2000 | 15 | 705 | 127 | 1300 | 234 | 2125 | 383 | 0.6 | 0.1 | 39.2 | 7.0 | 0.0 | 0.0 |
| 5556 | AS | 30 | 7.0 | 4000 | 12 | 630 | 91 | 780 | 112 | 1950 | 281 | 15.5 | 2.2 | 41.5 | 6.0 | 0.1 | 0.0 |
| 5206 | D | 7 | 3.3 | 1200 | 75 | 213 | 191 | 336 | 302 | 480 | 432 | 4.0 | 3.6 | 3.0 | 2.7 | 10.1 | 9.1 |
| 5207 | C | 7 | 3.9 | 600 | 10 | 68 | 8 | 156 | 19 | 175 | 21 | 10.0 | 1.2 | 4.0 | 0.5 | 0.0 | 0.0 |
| 5208 | D | 7 | 3.1 | 1100 | 36 | 200 | 86 | 320 | 138 | 420 | 181 | 2.0 | 0.9 | 4.0 | 1.7 | 10.0 | 4.3 |
| 5209 | D | 7 | 2.6 | 800 | 12 | 89 | 13 | 153 | 22 | 220 | 32 | 4.0 | 0.6 | 3.0 | 0.4 | 0.0 | 0.0 |
| 5210 | D | 7 | 3.3 | 625 | 25 | 53 | 16 | 432 | 130 | 220 | 66 | 5.0 | 1.5 | 2.0 | 0.6 | 5.0 | 1.5 |
| 5211 | R | 9 | 1.8 | 8000 | 20 | 12,000 | 2,880 | 270 | 65 | 4,800 | 1,152 | 1600.0 | 384.0 | 2.0 | 0.5 | 100.0 | 24.0 |
| 5212 | R | 7 | 2.8 | 1150 | 45 | 330 | 178 | 72 | 39 | 330 | 178 | 90.0 | 48.6 | 0.5 | 0.3 | 10.0 | 5.4 |
| 5213 | R | 7 | 3.6 | 1600 | 23 | 437 | 121 | 564 | 156 | 760 | 210 | 2.0 | 0.6 | 25.0 | 6.9 | 25.0 | 6.9 |
| 5214 | R | 7 | 1.5 | 8000 | 15 | 5,430 | 977 | 950 | 171 | 17,525 | 3,154 | 6000.0 | 1,080.0 | 14.0 | 2.5 | 600.0 | 108.0 |
| 5215 | Sh | 7 | 6.9 | 1000 | 2,889 | 200 | 6,934 | 352 | 12,203 | 500 | 17,334 | 85.0 | 2,946.8 | 4.0 | 138.7 | 5.0 | 173.3 |
| 5216 | C | 7 | 7.5 | 400 | 30 | 4 | 0 | 152 | 55 | 115 | 41 | 7.0 | 0.3 | 2.0 | 0.1 | 0.0 | 0.0 |
| 5217 | R | 7 | 3.1 | 5750 | 30 | 5,100 | 1,836 | 1,264 | 455 | 4,265 | 1,535 | 1,000.0 | 360.0 | 20.0 | 7.2 | 200.0 | 72.0 |